

Anxiety-related Cognitions in Close Relationships

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Declaration

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Abstract

Etiological models of anxiety have increasingly emphasized the role of information processing biases, and there is evidence that children, as well as adults exhibit these biases. However, to date, little is known about the origins of these biases. This thesis aims to explore whether interpretation bias and fear beliefs might be acquired from significant others in close relationships (i.e., parents, friends and romantic partners). It also considers a range of developmental stages to identify potential sources of influence that may play a role in the acquisition and/or maintenance of information processing biases across development. The thesis aims are realised across four studies that explore shared anxiety-related cognitions in distinct close relationships. The main findings of this thesis are summarized as follows. First, there is some evidence that individuals in close relationships exhibit similar patterns of anxiety-related cognitions, namely in close friends in middle childhood, as well as in parents and their young adult children. Second, there is some indication that anxiety-related cognitions might be acquired via the verbal information pathway from significant others in close relationships, such as from parents, close friends, and romantic partners. Third, factors such as the difference in anxiety levels between individuals in close relationships, relationship closeness, and attachment do not appear to moderate the transmission of anxiety-related cognitions in close relationships. Finally, results showed a significant relationship between anxiety-related cognitions and anxiety in middle childhood and young adulthood, but not in early childhood, indicating that interpretation bias may initially develop during the preschool years and may not show an association with anxiety until middle childhood. Taken together, these results indicate that anxiety-related cognitions can be transmitted within close relationships, and that verbal information appears to be a viable pathway in which such cognitions may be transmitted.

Chapter 1: General Introduction

1.1 Anxiety Disorders

Anxiety is a natural and adaptive emotion that plays a protective role against threat. The cognitive (e.g., thoughts such as “I am in danger!”), physiological (e.g., accelerated respiration, increased heart rate), and behavioural manifestations (fight or flight) of the anxiety emotion (Lang, 1985) operate as a warning and coping system to increase our chances of survival during an encounter with potential threat (Craske, 2003). Therefore, it is typical for children to experience anxiety, and these fears usually diminish as children develop (Gullone, 2000). However, some children may experience persistent and intense fears and anxiety, which could develop into anxiety disorders that interfere with daily functioning (Muris & Field, 2008). Anxiety becomes pathological when it is excessive and uncontrollable, and is experienced even without the actual presence of a threat. A wide range of affective and physical symptoms, as well as changes in cognition and behaviour, accompany pathological anxiety. As outlined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-V; American Psychiatric Association, 2013), anxiety disorders include separation anxiety disorder, selective mutism, specific phobia, social anxiety disorder (social phobia), panic disorder, panic attack (specifier), agoraphobia, generalized anxiety disorder, substance/medication-induced anxiety disorder, anxiety disorder due to other medical condition, other specified anxiety disorder, and unspecified anxiety disorder.

Anxiety disorders are one of the most prevalent psychiatric problems in children and adolescents. Several studies suggest that at any given time, approximately 2.5% to 5% of children and adolescents meet criteria for an anxiety disorder (Breton et al., 1999; Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Ford, Goodman, & Meltzer, 2003; Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993; Lewinsohn, Zinbarg, Seeley, Lewinsohn, & Sack, 1997). Some studies have even attested that the prevalence rate of childhood anxiety

disorders is as high as 10% across childhood and adolescence (Costello, Egger, & Angold, 2004, 2005; Velting, Setzer, & Albano, 2002).

Anxiety disorders have a moderate to high impact on children's functioning and appear to be as disabling as other childhood disorders (Ezpeleta, Keeler, Erkanli, Costello, & Angold, 2001). Anxious children are likely to experience difficulties in school, such as having low classroom participation, irregular school attendance, and academic underperformance, and struggle in social settings, such as initiating and maintaining friendships. They also tend to experience conflict and disruption within the family environment with siblings and parents, and experience psychological distress that affects their self-image (see Greco & Morris, 2004; Muroff & Ross, 2011 for a review). Furthermore, retrospective studies have found that anxiety that develops in early childhood, if left untreated, often persists into adulthood (Kessler, Berglund, Demler, Jin, & Walters, 2005), increasing the risk for adult anxiety disorders, substance abuse, depression and suicide attempts (Beesdo et al., 2007; Bittner et al., 2007; Boden, Fergusson, & John Horwood, 2007; Gregory et al., 2007; Pine, Cohen, Gurley, Brook, & Ma, 1998). Besides the psychosocial effects mentioned above, anxiety disorders are also highly economically taxing. In 2007, the cost of health services for anxiety disorders for the whole of England was approximately £1.2 billion. By 2026, the projected health services cost is £2 billion (McCrone, Dhanasiri, Patel, Knapp, & Lawton-Smith, 2008). Given the high psychosocial and economic burden associated with anxiety disorders, understanding the development of these disorders and identifying effective intervention strategies is crucial.

Etiological models have identified a range of factors that might play a role in the development and/or maintenance of anxiety disorders. These include genetics, temperament, attachment, cognitive, and environmental risk factors (Drake & Ginsburg, 2012; Hadwin, Garner, & Perez-Olivas, 2006; Murray, Creswell, & Cooper, 2009; Rapee, Schniering, & Hudson, 2009). To provide a broad introduction to the etiology of anxiety

disorders, a brief overview of the literature relevant to each of these is outlined below. This is followed by a more detailed examination of theory and research on cognition, the primary focus of this thesis.

1.2 Genetics

Research has consistently demonstrated higher rates of anxiety disorders in children of anxious parents (top-down studies) (Schreier, Wittchen, Höfler, & Lieb, 2008; Turner, Biedel, & Costello, 1987; Weissman, Leckman, Merikangas, Gammon, & Prusoff, 1984) and in parents of anxious children (bottom-up studies) (Cooper, Fearn, Willetts, Seabrook, & Parkinson, 2006; Last, Hersen, Kazdin, Orvaschel, & Perrin, 1991; Last, Hersen, Kazdin, Francis, & Grubb, 1987), compared to non-anxious child or parent samples. For instance, Turner et al. (1987) found that 7-12 year-old children of anxious parents were 7 times more likely to be diagnosed with an anxiety disorder compared to children of parents without any psychiatric disorders. They were also twice as likely to be diagnosed with an anxiety disorder, compared to children of parents diagnosed with dysthymia. In accordance with Turner and colleagues' study, a more recent longitudinal community study (Schreier et al., 2008) of 933 mother-child pairs also demonstrated an elevated rate of anxiety disorders in adolescents who had anxious mothers in comparison to adolescents who had mothers who were not anxious.

While these studies show familial aggregation of anxiety, it is not possible to separate genetic and environmental influences in studies of this nature. Instead, twin studies can be used to estimate the genetic and environmental influences on the development of anxiety disorders (Eley & Lau, 2005). Reviews of twin studies (Eley & Gregory, 2004; Gregory & Eley, 2007) suggest that anxiety has moderate heritability, with approximately 30% of the variance accounted for by genetics. This indicates that environmental factors also play a crucial role in the development of anxiety.

1.3 Temperament

Specific temperament styles are associated with a greater vulnerability for developing anxiety. Two temperament styles that have been extensively studied in the context of child anxiety are behavioural inhibition and negative affectivity.

1.3.1 Behavioural Inhibition

Behavioural inhibition (BI) is a temperament style that has been identified as an early risk factor for the development of anxiety disorders (Hudson, Dodd, Lyneham, & Bovopoulos, 2011; Rapee & Coplan, 2010). Behaviourally inhibited children tend to take longer to approach or communicate with strangers, stay within close proximity of attachment figures, show signs of distress or withdrawal in novel or new situations, and are socially inhibited and restricted (Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984). It is estimated that approximately 15% of children in the general population are behaviourally inhibited (Fox, Henderson, Marshall, Nichols, & Ghera, 2005) and that BI has moderate to strong heritability, with an estimated 50% -80% of its variance explained by genetics (DiLalla, Kagan, & Reznick, 1994; Robinson, Kagan, Reznick, & Corley, 1992).

A large body of longitudinal research has consistently indicated that BI during early childhood is associated with anxiety symptoms and disorders later in life (Chronis-Tuscano et al., 2009; Mian, Wainwright, Briggs-Gowan, & Carter, 2011). For instance, in a recent prospective study involving a large representative cohort, parent-reported behavioural inhibition at approximately 3 years old was significantly associated with parent-reported anxiety symptoms at age six and both parent- and child-reported anxiety symptoms at age eight (Mian et al., 2011).

There is some evidence that early BI is particularly associated with social anxiety disorder (Chronis-Tuscano et al., 2009; Hirshfeld-Becker et al., 2007). However, a recent cross-sectional study examining multiple risk factors for childhood anxiety in preschool-aged children (aged 4 years) provided evidence that BI may also be associated with a wider range

of anxiety disorders, such as specific phobia and separation anxiety disorder, in addition to social anxiety disorder (Hudson, Dodd, & Bovopoulos, 2011). Subsequently, a 2-year follow-up of this sample found that BI measured at baseline significantly predicted social anxiety disorder and generalized anxiety disorder at age 6 (Hudson, Dodd, Lyneham & Bovopoulos, 2011), while a 5-year follow-up (Hudson & Dodd, 2012) showed that BI at baseline was associated with greater risk for social anxiety disorder, separation anxiety disorder and generalized anxiety disorder at age 9. Despite the convincing link between BI and anxiety, only a proportion of behaviourally inhibited children go on to develop an anxiety disorder. Therefore, etiological models of childhood anxiety (Hudson & Rapee, 2004; Vasey & Dadds, 2001) have emphasized the importance of examining ways in which child temperament and environmental risk factors work together to affect risk pathways to anxiety disorders.

1.3.2 Negative Affectivity

Negative affectivity is another temperament style that has often been associated with anxiety disorders (Lonigan & Phillips, 2001; Muris & Ollendick, 2005). It is broadly defined as “the proneness to experience an array of negative emotional states, and to activate defensive motivational systems” (Craske, 2003, p.49), with negative emotions characterized by irritability, difficulty being soothed, negative mood, and intense negative emotional reactions (Sanson, Hemphill, & Smart, 2004). Negative affectivity is an overarching construct, overlapping with concepts of neuroticism (Eysenck, 1967), sensitivity to punishment (Gray, 1987), and negative affect (Clark & Watson, 1991).

There is evidence of multifinality of this construct, meaning that it is a common factor underlying many forms of childhood emotional disorders (Shaw, Keenan, Vondra, Delliquadri, & Giovannelli, 1997). Several studies have identified negative affectivity as an early risk factor for anxiety and internalizing (encompassing anxiety and depressive domains) symptoms. In a prospective study involving a representative birth cohort, temperament (both negative affectivity and behavioural inhibition) assessed during toddlerhood/

preschool age (mean age = 36.04 months, SD= 6.84), was identified as one of the most robust predictors of anxiety symptoms in kindergarten (mean age = 6.03 years, SD = 0.39) and second grade (mean age = 8.01 years, SD = 0.49) (Mian et al., 2011). This finding is consistent with previous cross-sectional (Marakovitz, Wagmiller, Mian, Briggs-Gowan, & Carter, 2011) and longitudinal research (Biederman et al., 2001; Mesman & Koot, 2001). Hence, higher negative affectivity has been found to be associated with greater internalizing symptoms in young children (Cote et al., 2009; Marakovitz et al., 2011), older children and adults (Phillips, Lonigan, Driscoll, & Hooe, 2002).

Not all children with elevated negative affectivity exhibit greater levels of anxiety symptoms or consequently develop anxiety disorders. Hence, researchers have begun investigating potential mediating or moderating factors to aid understanding of the relationship between negative affectivity and anxiety symptoms/disorders. Currently, researchers propose that reactive temperaments (i.e., negative emotionality) may interact or work alongside regulative processes (i.e., effortful control) to affect risk for mental health problems in children and young people (Calkins & Fox, 2002; Lonigan & Phillips, 2001; Muris & Ollendick, 2005). For example, a large body of research has found that high levels of negative affectivity and low levels of effortful control are associated with both internalizing (anxious-depressive) and externalizing (aggressive-delinquent) symptoms in children across various age groups (Meesters, Muris, & van Rooijen, 2007; Muris, Meesters, & Blijlevens, 2007; Oldehinkel, Hartman, De Winter, Veenstra, & Ormel, 2004). Hence, although elevated negative affectivity has been identified as an early risk factor, high levels of effortful control may act as a buffer against anxiety disorders (Muris & Ollendick, 2005), explaining why a proportion of children with elevated negative affectivity do not exhibit anxiety symptoms or consequently develop anxiety disorders.

1.4 Attachment

Attachment, defined as the quality of the parent-child bond, has been implicated as a risk factor for the development of anxiety disorders (Drake & Ginsburg, 2012; Bögels & Brechman-Toussaint, 2006). Attachment theory (Bowlby, 1969; 1973) posits that young children become insecurely attached if they have caregivers who are unpredictable in their availability, sensitivity and responsiveness. Children who are insecurely attached develop internal working models (mental representations of the self and others) that consist of negative expectations about the self in relation to others (Bowlby, 1989), which lead to distress, chronic vigilance, and a fear of abandonment (Bowlby, 1973). Research indicates that insecurely attached children tend to have poor self-regulatory skills (Stams, Juffer, & Van IJzendoorn, 2002), and are less adept at social situations, such as establishing and maintaining friendships (Sroufe, Carlson, & Shulman, 1993), which may increase their vulnerability to developing anxiety. In line with the above, evidence suggests that attachment insecurity is associated with elevated anxiety (Bar-Haim, Dan, Eshel, & Sagi-Schwartz, 2007; Muris, Mayer, & Meesters, 2000), as well as anxiety disorders (Manassis, Bradley, Goldberg, & Hood, 1995; Warren, Huston, Egeland, & Sroufe, 1997). A meta-analysis by Colonna et al. (2011) showed a significant, moderate ($r = .30$) relationship between attachment insecurity and anxiety in children. Moreover, in terms of attachment styles, ambivalent attachment has been identified as a stronger predictor of anxiety than avoidant attachment or attachment insecurity generally (Colonna et al., 2011; Bar-Haim et al., 2007; Bögels & Brechman-Toussaint, 2006).

1.5 Life Events and Difficulties

Adverse or negative life events have also been identified as a risk factor for the development of anxiety disorders (Murray, Creswell, & Cooper, 2009; Rapee, Schniering, & Hudson, 2009). Chronic adversities, such as family pathology (i.e., parent mental illness, parental substance problems, parental criminal behaviour, and family violence) as well as

neglect and abuse (i.e., physical abuse, sexual abuse, and neglect) have been identified as strong predictors of the onset of psychopathology, including anxiety disorders (Benjet, Borges, & Edina-Mora, 2010). As evidence suggests that childhood adversity is related to the onset of psychopathology across various stages of development (i.e., childhood, adolescence, and adulthood), Benjet et al. (2010) speculate that chronic stress from early adversities may have an enduring effect on brain structures (e.g., amygdala, frontal cortex) associated with psychological disorders.

Furthermore, research suggests that adverse life events might interact with the child's existing risk factors (e.g., temperament) (Rapee et al., 2009). For instance, contemporary learning models suggest that, aside from exposure to adverse life events, the role of individual vulnerabilities, previous learning experiences and stressors, as well as post-exposure experience, determines whether an individual develops anxiety (e.g., Muris, Merckelbach, de Jong, & Ollendick, 2002). Consistent with this proposition, research on children with posttraumatic experiences indicated the central role of pre-existing individual vulnerability (e.g. history of psychopathology before trauma exposure) in the development of post-traumatic stress disorder (PTSD) (Pine & Cohen, 2002). Similarly, a prospective study revealed that preschool-aged children's anxiety symptoms were predicted by the perceived impact of the negative life events they had experienced in the past 12 months. In turn, this perceived impact on the children was predicted by their temperamental vulnerability, namely high levels of behavioural inhibition (Edwards, Rapee, & Kennedy, 2010).

Due to the difficulty of determining the precise onset of anxiety disorders and establishing the occurrence of negative life events preceding the onset of the disorder, a causal relationship between negative life events and the development of anxiety disorders has yet to be established (Rapee et al., 2009). Nevertheless, evidence from several prospective studies seems to indicate the possibility that life events may play a causal role. For instance, studies have suggested that anxious children experience a greater number of

adverse life events in the 12-month period prior to the onset of the disorder, compared to non-anxious children (Allen, Rapee, & Sandberg, 2008; Goodyer, Wright, & Altham, 1988). Furthermore, a recent prospective study involving children aged 3-4 years showed that negative life events and the impact of those events predicted the increase in anxiety symptoms, the probability of being diagnosed with an anxiety disorder, as well as the increase in the number of anxiety diagnoses over a 5-year period, suggesting that negative life events may play a causal role in the development of anxiety (Broeren, Newall, Dodd, Locker & Hudson, 2014).

1.6 Parenting Practices

Recent research has increasingly emphasized the role of parenting practices in the development, maintenance and amelioration of childhood anxiety (McLeod, Wood, & Avny, 2011). In the section that follows, the environmental pathway relating to parenting factors, namely parenting styles and parental modelling of anxious behaviour, will be discussed.

1.6.1 Parenting Styles

In the past two decades, a large body of research has found associations between parenting behaviours and childhood anxiety, although the strength of these associations has been quite modest. A meta-analytic review by McLeod, Wood and Weisz (2007) indicated that 'parenting' (as a general factor incorporating parental control and rejection) only explains 4% of the variance in childhood anxiety. Nevertheless, when more specific parenting styles such as parental overcontrol and rejection are considered, there is some evidence for the role of parenting in childhood anxiety. Therefore, Creswell, Murray, Stacey and Cooper (2011) emphasized the importance of considering specific parental factors as one of the many potential risks or maintenance pathways to childhood anxiety. Overall, there is less convincing evidence on the role of rejection, compared to parental control in explaining child anxiety, with only 4% of the variance in anxiety accounted for by parental

criticism/ rejection while parental overcontrol contributes to 6% of this variance (McLeod et al., 2007).

1.6.1.1 Parental Overcontrol.

Parental overcontrol occurs when parents excessively regulate children's activities and routines, encourage their children to be dependent on them and instruct them how to think or feel (e.g. Barber & Buehler, 1996). In the current literature, parental overcontrol has been synonymously used with terms such as restrictive behaviours and overprotection. The overlapping constructs and inconsistency in terms used can lead to apparent discrepancies and confusion when interpreting findings (Drake & Ginsburg, 2012). Nonetheless, it is theorised that these behaviours limit children's exposure to new and challenging experiences and restrict them from developing mastery and confidence in their ability to overcome these challenges, increasing the child's risk for anxiety (Affrunti & Ginsburg, 2012). In support of this, regardless of the status of maternal anxiety, mothers of anxious children tend to be perceived by their children (Bögels & van Melick, 2004; McClure, Brennan, Hammen, & Le Brocque, 2001) and independent observers (Barrett, Fox, & Farrell, 2005; Edison et al., 2011; Moore, Whaley, & Sigman, 2004) as being restrictive and excessively controlling, compared to mothers of non-anxious children. Moreover, there is emerging evidence indicating that parental overcontrol predicts subsequent anxiety symptoms in children (Edwards et al., 2010; Ginsburg, Grover, & Ialongo, 2005) and anxiety disorders in adolescents/ young adults (Beesdo, Pine, Lieb, & Wittchen, 2010). For instance, a meta-analysis by Van der Bruggen, Stams and Bögels (2008) indicated a positive association between parental overcontrol and child anxiety (effect size: $d = .58$). Similarly, McLeod et al. (2007) found that parental control accounts for approximately 6% of the variance in child anxiety.

1.6.1.2 Rejection.

Parental rejection occurs when children experience low levels of warmth, approval and responsiveness from parents (e.g. Clark & Ladd, 2000; Maccoby, 1992). Researchers propose that children are negatively affected by parental criticism and rejection, decreasing their sense of self-worth and self-competence, resulting in increased anxiety in children (Ginsburg & Schlossberg, 2002; Rapee, 1997). Although several cross-sectional studies have found a positive association between parental criticism/rejection and childhood anxiety disorders (Hudson, Dodd, & Bovopoulos, 2011; Lieb et al., 2000), as well as anxiety symptoms (Lieb et al., 2000; Festa & Ginsburg, 2011; Hudson & Rapee, 2001), longitudinal research has failed to show that parental criticism/rejection predicts anxiety in children over time (Hudson, Dodd, Lyneham & Bovopoulos, 2011; Hudson & Dodd, 2012). This suggests that parental criticism/rejection may not play a causal role in childhood anxiety, but instead indicates that parents may tend to respond to their anxious children in this manner.

1.6.2 Parental Modelling of Anxious Behaviours

Another way in which parents might affect their children's anxiety is via parental modelling of anxious behaviours. Children might learn to be anxious and avoidant by observing anxious attitudes and avoidant behaviours by their parents (Beidel & Turner, 1997; Fisak & Grills-Taquechel, 2007). Fisak and Grills-Taqueche (2007) argue that parental modelling is neither necessary nor sufficient to explain anxiety development, although it might increase children's risk for acquiring fears or interact with other factors to elevate an individual's risk of developing anxiety disorders. Consistent with this idea, Rapee (2002) posited that children predisposed to develop anxiety disorders may be more vulnerable to environmental influences, such as parental modelling.

Due to inconsistencies across studies, it is difficult to determine the strength of the association between parental modelling and child anxiety (see Fisak & Grills-Taquechel, 2007; Wood, McLeod, Sigman, Hwang, & Chu, 2003, for reviews). However, correlational

studies show a positive association between parent-reported modelling of anxious behaviour and child-reported fear (Muris, Steerneman, Merckelbach, & Meesters, 1996). In addition, child-reported parental modelling is also positively associated with anxiety symptoms in children high in trait anxiety (Grüner, Muris, & Merckelbach, 1999; Roelofs, Meesters, ter Huurne, Bamelis, & Muris, 2006).

More recent studies have employed experimental approaches to investigate the causality between parental modelling and child anxiety. For instance, infants have been found to mirror their mothers' behaviour when responding to a stranger (De Rosnay, Cooper, Tsigaras, & Murray, 2006). When mothers previously displayed a fearful (instead of positive or neutral) behaviour towards the stranger, infants mirrored their mothers' behaviour by subsequently showing more fear and avoidance towards the stranger. Furthermore, toddlers are also affected by parental modelling of anxious behaviour, showing higher levels of fear and greater behavioural avoidance of stimuli that have been paired with their mothers' negative (instead of positive or neutral) facial expression (Gerull & Rapee, 2002).

More recently, Burstein and Ginsburg (2010) showed that parental modelling of anxious behaviour resulted in elevated levels of anxiety and behavioural avoidance in children (aged 8 to 12 years) from a non-anxious sample. Child-parent pairs were randomly assigned to either an anxiety-provoking condition whereby parents behaved in an anxious manner before children were required to complete a spelling test, or a non-anxiety-provoking condition whereby parents were relaxed and confident before the spelling test. Results showed that parental expression of anxiety resulted in higher levels of anxiety and greater desire to avoid the spelling test in children.

Furthermore, findings from a longitudinal study showed evidence for the intergenerational transmission of social anxiety in an anxious population, whereby maternal modelling of anxious behaviours predicted young children's avoidance of a stranger over

time (Murray, Cooper, Creswell, Schofield, & Sack, 2007). Mothers with social phobia, generalized anxiety disorder (GAD) and non-anxious mothers were recruited with their 10-week-old infants. Mothers' behaviours were observed in a social challenge task whereby they had a conversation with a stranger. Results revealed that compared to non-anxious mothers, mothers with social phobia (but not generalized anxiety disorder) were significantly more anxious, less engaging with the stranger and less encouraging when their children interacted with the stranger. Additionally, maternal expression of social anxiety at 10 months subsequently predicted infant's avoidance of the stranger at 14 months. Therefore, this research provides evidence that parental modelling of anxious behaviour may affect the development of anxiety in children.

1.7 Information Processing Biases in Anxiety

Researchers have implicated the role of biased information processing in the development of emotional problems (e.g., Beck, Emery, & Greenberg, 1985; Muris & Field, 2008). For instance, Beck et al. (1985) proposed that dysfunctional cognitions lie at the core of anxiety disorders. Information-processing models (e.g. Mathews & MacLeod, 2005; Muris & Field, 2008) suggest that biases in information processing operate throughout several stages of cognition, including encoding, interpretation and response selection, to cause (MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002) and maintain (Mogg & Bradley, 1998) emotional disorders.

Even though research has begun exploring information processing biases in children, historically there has been a lack of developmentally appropriate models that describe cognitive biases (e.g., Field, Cartwright-Hatton, Reynolds, & Creswell, 2008). Instead, research in childhood anxiety has often adopted or extended adult models and theoretical frameworks that might not account for the role of cognitive, emotional and social development in children (Field & Lester, 2010). Therefore, Muris and Field (2008) propose an adapted theoretical model of information processing for childhood anxiety, which

combines Kendall's (1985) cognitive theory of childhood anxiety and Crick and Dodge's (1994) information processing model. Kendall's (1985) cognitive theory posits that chronic overactivity of danger and vulnerability schemas direct cognitive processes towards threat-related information, leading to biases in information processing. The dysfunctional and maladaptive thoughts and behaviours of anxiety disorders are thought to be the result of these cognitive processes that are biased and erroneous.

Crick and Dodge's (1994) model of information processing has been used to illustrate the various stages of information processing at which specific cognitive distortions may occur in anxious children (see Daleiden & Vasey, 1997). This model uses a step-wise approach to describe consecutive stages of information processing, providing a comprehensive model that allows researchers to identify biases in information processing at each stage. In the initial stage of information processing, information is selected for further processing (encoding). Subsequently, meaning is attached to the information after decoding (interpretation). Then, a response is retrieved and chosen (response search and selection) and finally, the selected response is produced (enactment).

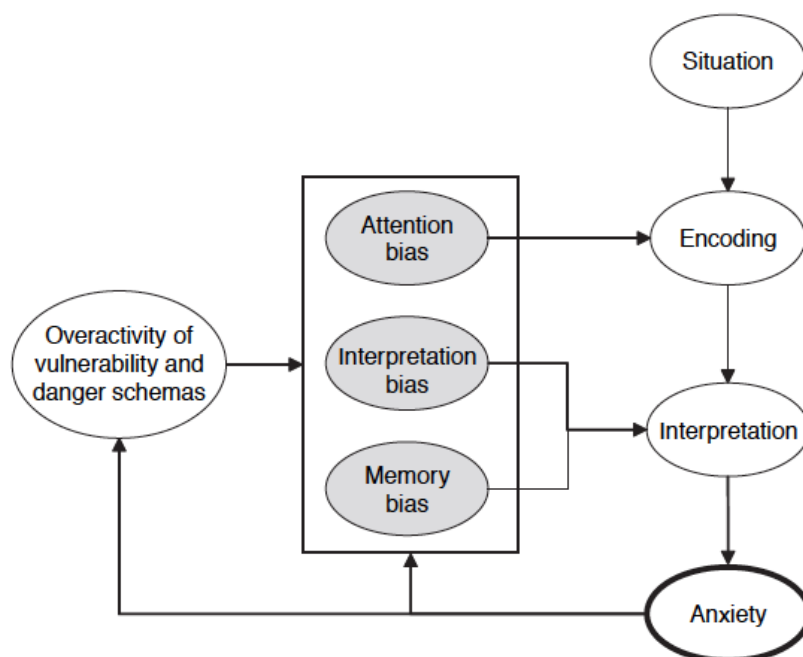


Figure 1. Muris and Field's (2008) theoretical model of childhood anxiety disorders illustrating threat-related biases in different stages of information processing.

Figure 1 shows Muris and Field's (2008) model of information processing in childhood anxiety disorders, combining Kendall's (1985) cognitive theory of childhood anxiety and Crick and Dodge's (1994; see Daleiden & Vasey, 1997) information processing model. The model shows that attentional bias occurs during the encoding stage when anxious children selectively attend to threatening stimuli. Additionally, memory bias and interpretation bias occur during the interpretation stage when anxious children show enhanced memory for threatening information and evaluate situations as dangerous by attaching threatening meaning to ambiguous stimuli. As a result, it is theorised that these information processing biases elicit feelings of fear and anxiety in anxious children, which consequentially accentuates the occurrence of the biases and may also reinforce the maladaptive schemas of danger and vulnerability.

As there is currently more convincing evidence for the role of attentional and interpretation bias in anxiety in comparison to memory bias, the following sections will focus

on outlining the evidence for both these biases in adults and children. Although research in this area primarily focuses on negative cognitive biases as a contributory factor in the cause and maintenance of emotional disorders, it should be emphasized that biased information processing does not exclusively occur in emotionally disordered populations. Indeed, Hirsch and Mathews (2000) suggest that emotionally stable populations also exhibit biases in cognition, which may instead be positively valenced.

1.7.1 Attentional Bias in Anxiety

1.7.1.1 Evidence from studies with adults.

Cognitive models of anxiety (Beck et al., 1985; Mathews & MacLeod, 2005) suggest that anxiety is associated with increased attention to potentially threatening material (MacLeod, Mathews, & Tata, 1986; Mathews & MacLeod, 1985). A large body of research employing a variety of experimental paradigms has examined whether anxious individuals exhibit an attentional bias towards threatening stimuli. Although there is some inconsistency in findings, a meta-analysis concluded that an association between anxiety and attentional bias exists at a small to moderate effect size (see Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van Ijzendoorn, 2007, for review).

Early evidence of an attentional bias for threat cues in anxiety comes from research employing a modified version of the Stroop paradigm. In the Emotional Stroop task, participants are presented with coloured threat-related and neutral words, and are required to name the colour of the words, while ignoring its meaning. Based on the proposition that anxiety is linked to poorer inhibitory processes towards threatening over neutral information (Eysenck, Derakshan, Santos, & Calvo, 2007), it is reasoned that anxious participants will be slower to respond to threat-related words. Studies employing this methodology have found that anxious participants are slower to name the colours of threat-related words, compared to neutral words, indicating a threat-related attentional bias (Mathews & MacLeod, 1985; Mogg, Mathews, & Weinman, 1989). However, the relevance

of the Stroop task as a measure of attentional bias has been questioned, as it is difficult to tease apart the cause of the delayed response, and this interference may be caused by emotional disruption instead of attentional biases (Mathews & MacLeod, 2005).

Another method for assessing attentional bias is the dot-probe task, which enables a somewhat more direct measure of attentional distribution. In this task, two competing stimuli (one threatening and one neutral word or picture) are simultaneously and briefly (e.g. 500ms) presented on the screen. The stimuli disappear and a probe appears on the location previously occupied by one of the stimuli. It was reasoned that individuals are quicker to respond to a probe presented in an attended, instead of an unattended location. Therefore, attentional bias towards threat is demonstrated by faster responses to probes preceded by a threatening cue relative to probes preceded by neutral words. Consistent with this proposition, anxious individuals have been found to respond more quickly to probes that replace threatening rather than neutral stimuli (Broadbent & Broadbent, 1988; MacLeod et al., 1986; Mogg, Bradley, & Williams, 1995), indicating a tendency to attend to threatening over neutral stimuli. Evidence of attentional bias to threat using the dot-probe task has been observed using threat-related lexical and pictorial stimuli in populations with specific phobia (Lavy, Van den Hout, & Arntz, 1993), panic disorder (McNally, Riemann, & Kim, 1990), general anxiety disorder (Bradley, Mogg, White, Groom, & Bono, 1999; MacLeod et al., 1986) and social phobia (Mogg, Philippot, & Bradley, 2004). Additionally, studies using eye-movement monitoring during visual probe tasks show that individuals with generalized anxiety disorder have quicker and more frequent initial orientation towards threatening faces, compared to depressed individuals and controls (Garner, Mogg, & Bradley, 2006b; Mogg, Millar, & Bradley, 2000).

1.7.1.2 Evidence from studies with children.

Attentional bias has also been extensively studied in empirical studies with children (see Field, Hadwin, & Lester, 2011; Hadwin et al., 2006; Muris & Field, 2008, for reviews).

Research employing the Emotional Stroop task has found that anxious children typically display longer latencies (although some studies found shorter latencies) in naming the colour of threat-related stimuli (see Nightingale, Field, & Kindt, 2010, for a review). For example, in a series of early studies involving non-clinical populations, Martin and colleagues demonstrated the occurrence of attentional bias in spider fearful children within several age groups (4-5 years, 6-7 years, 8-9 years and 6-13 years). In comparison to non-spider fearful children, those who were fearful were slower to name the colours of spider-related words compared to neutral words (Martin, Horder, & Jones, 1992; Martin & Jones, 1995). Additionally, research adopting the dot probe paradigm has also found a link between anxiety and attentional bias (Vasey, Daleiden, Williams, & Brown, 1995; Vasey, El-Hag & Daleiden, 1996). For instance, compared to non-anxious children (aged 9-14 years), clinically anxious children were quicker to respond to a probe that was preceded by a threatening word than a non-threatening word (Vasey et al., 1995). Moreover, Dalgleish et al. (2003) found that clinically anxious children and young people (aged 7-18 years) exhibited selective attention towards threat words, compared to depressive-related words.

As a whole, a recent meta-analysis by Dudeney, Sharpe and Hunt (2015) concluded that anxious children do show a greater attentional bias towards threat-related stimuli than non-anxious controls, and this bias was moderated by age. That is, the difference between the anxious and non-anxious groups in attentional bias became greater as age increased. Dudeney and colleagues suggest that all young children show an attentional bias towards threat-related stimuli regardless of their anxiety. As children mature, non-anxious children learn to inhibit automatic responding to threat. However, anxious children fail to develop such inhibitory mechanisms, causing them to continue displaying an attentional bias to threat into later life. This interpretation is consistent with the cognitive inhibition hypothesis (Kindt & Van Den Hout, 2001; Lonigan, Vasey, Phillips, & Hazen, 2004), which suggests that

the emergence of information processing biases in children is influenced by the development of inhibition or effortful control.

1.7.2 Interpretation of Ambiguity in Anxiety

1.7.2.1 Evidence from studies with adults.

Cognitive models of anxiety (e.g. Beck et al., 1985; Mathews & MacLeod, 2005, Muris & Field, 2008) suggest that anxiety is associated with a tendency to disproportionately interpret ambiguous situations as threatening. In line with this proposition, a range of experimental paradigms have consistently found that anxious individuals are more likely to interpret ambiguous stimuli in a threat-related way, when compared to non-anxious individuals (Hadwin et al., 2006; Mathews & MacLeod, 1994; Rusting, 1998). For instance, when presented with homophones (two words with the same pronunciation, but spelt differently, one with a threatening meaning, while the other a neutral meaning), clinically anxious adults and those with high levels of trait anxiety were more likely to spell the words in a way that was consistent with the threatening interpretation (e.g. die instead of dye), compared to controls (Eysenck, MacLeod, & Mathews, 1987; Mathews, Richards, & Eysenck, 1989; Mogg et al., 1994). Similarly, when presented with ambiguous sentences, delayed recognition-memory tests revealed that anxious adults were more likely to have encoded ambiguous sentences in a threatening way than recovered clinically anxious participants and non-anxious adults (Eysenck, Mogg, May, Richards, & Mathews, 1991). Subsequent research employing various methodologies such as the lexical decision tasks involving homographs (Richards & French, 1992), ambiguous sentences (Calvo & Castillo, 1997; Calvo, Eysenck, & Estevez, 1994; MacLeod & Cohen, 1993), illusory correlation paradigms (Garner, Mogg, & Bradley, 2006a; Tomarken, Mineka, & Cook, 1989), and the presentation of emotionally ambiguous facial images (Richards et al., 2002; Winton, Clark, & Edelmann, 1995) has consistently provided evidence of threat-related interpretation biases in anxious adults.

1.7.2.2 Evidence from studies with children.

Interpretation bias has also been extensively documented in empirical studies with children (see Hadwin et al., 2006; Muris & Field, 2008; Field, Hadwin & Lester, 2011 for reviews). Extending adult research, interpretation bias in children has been explored using homographs (e.g., Hadwin, Frost, French, & Richards, 1997; Taghavi, Moradi, Neshat-Doost, Yule, & Dalgleish, 2000) and stories (e.g., Barrett, Rapee, Dadds, & Ryan, 1996; Chorpita & Albano, 1996). Using the homograph methodology, Hadwin et al. (1997) measured trait anxiety in typically developing children aged 7 to 9 years and presented them with ambiguous pictorial homophones that can either be interpreted as neutral or threatening (e.g. dye versus die). Results revealed that a higher level of anxiety was associated with a higher frequency of threat interpretations. More recently, when children aged 8 to 17 years were asked to construct sentences from visually presented word homographs, researchers found that the clinically anxious group (compared with a non-clinical control group) had a greater tendency to generate sentences with a threatening meaning versus a neutral meaning, independent of their age or depression (Taghavi et al., 2000). In addition, clinically anxious children aged 8 to 12 years show a reduction in threat interpretation, measured using homograph tasks after exposure to cognitive behavioural treatment (Waters, Wharton, Zimmer-Gembeck, & Craske, 2008), indicating that interpretation bias in children can be modified with intervention.

Using a story-based methodology, a growing body of research has consistently found interpretation bias to be positively associated with anxiety in children (Chorpita & Albano, 1996; Creswell & O'Connor, 2006; Creswell & O'Connor, 2011; Creswell, O'Connor, & Brewin, 2006; Creswell, Shildrick, & Field, 2011; Dodd, Hudson, Morris, & Wise, 2012). For instance, Barrett et al. (1996) presented ambiguous scenarios to groups of clinically anxious, oppositional defiant and typically developing control children aged between 7 to 14 years. Results revealed that both anxious and oppositional children were more likely to make

threatening interpretations of the scenarios, compared to the controls. Interestingly, both groups of children differed in the manner in which they chose to resolve the ambiguous situations, with anxious children being more avoidant in their approach while the oppositional children were more aggressive. In two similar studies, when presented with ambiguous scenarios, anxious children made significantly more threatening interpretations, compared to children (aged 9 to 18 years) with externalizing disorders and controls (Bögels & Zigterman, 2000), and children (aged 7 to 12 years) considered to be at risk of developing anxiety due to having clinically anxious parents (Waters et al., 2008). Recently, the story-based approach in exploring interpretation bias has also been effectively used in younger children. In one of the few prospective studies involving young children, Dodd et al. (2012) used a story-stem paradigm to assess interpretation bias in preschool children aged between 3 and 4 years. Similar to research conducted with older children, clinically anxious preschool-aged children were more likely to make threatening interpretations of the ambiguous story-stems, compared to non-anxious children. The authors also showed that interpretation bias measured at baseline predicted anxiety symptoms 12-months later, but this longitudinal relationship was not found at 2-year or 5-year follow-up, indicating that interpretation bias in young children may play a maintenance role in anxiety for relatively short periods of time.

Additionally, researchers have also begun exploring variations of interpretation bias. For instance, Muris and colleagues (e.g., Muris, Kindt, et al., 2000; Muris, Luermans, Merckelbach, & Mayer, 2000; Muris, Merckelbach, & Damsma, 2000; Muris, Rapee, Meesters, Schouten, & Geers, 2003) have found evidence for “Reduced Evidence for Danger” (RED) bias, whereby anxious children tend to require less information than non-anxious children before perceiving an ambiguous situation as dangerous.

1.8 Origins of Information Processing Biases

As outlined, etiological models of anxiety have increasingly emphasized the role of information processing biases, and there is evidence that children, as well as adults exhibit these biases. Research has shown that approximately 30-40% of the variance in information processing biases can be explained by genetics (Eley & Zavos, 2010), leaving environmental factors to account for the remaining two-thirds of the variance. The following sections will explore the origins of information processing biases. First, research in cognitive bias modification in both adults and children will be outlined to demonstrate how biases can be acquired through training. Then, the way in which children's cognitive development might facilitate the learning of these biases will be examined using Field and Lester's (2010) developmental framework of information processing biases. Finally, the different pathways (classical conditioning, modelling or vicarious learning, and the transmission of verbal threat information) in which information processing biases can be acquired will be discussed, with a particular focus on the transfer of verbal information.

1.8.1 Cognitive Bias Modification in Adults and Children

Cognitive bias modification (CBM) is an experimental procedure designed to modify specific information processing biases that have been associated with the maintenance and/or onset of anxiety disorders. Research adopting this methodology has been interpreted as providing preliminary evidence that these biases play a causal role in anxiety (Mathews & Mackintosh, 2000; Wilson, MacLeod, Mathews, & Rutherford, 2006), suggesting that such biases can be acquired or modified, which will in turn result in a change in anxiety. For instance, Wilson et al. (2006) used a training program to induce either a threat or non-threat interpretation bias in a group of non-anxious adults. Following exposure to an emotional event, those who received threat training showed greater anxiety than those who received non-threat training. Moreover, Mathews, Ridgeway, Coon, and Yiend (2007) showed that when highly anxious participants were given benign interpretation bias training, they

showed a reduction in their trait anxiety symptoms. However, there have been some inconsistencies in the results from CBM research. Some meta-analyses and reviews suggested that CBM is efficacious in modifying biases and reducing anxiety (e.g. Hallion & Ruscio, 2011; MacLeod & Mathews, 2012), while others showed little evidence for its efficacy in reducing anxiety in both clinical and non-clinical adult populations (Cristea, Kok & Cuijpers, 2015).

Similarly, cognitive bias manipulation techniques have also been used in child research. For instance, Muris and colleagues (Muris, Huijding, Mayer, & Hameetman, 2008; Muris, Huijding, Mayer, Remmerswaal, & Vreden, 2009) used an innovative analogue known as the 'space odyssey paradigm' to modify interpretation bias in children. In this paradigm, both clinically anxious and non-anxious children aged 8 to 12 years were first guided to imagine taking a journey to a planet that is unknown. Then, they were presented with ambiguous scenarios, such as "On the street, you encounter a spaceman. He has a sort of toy handgun and he fires at you..." and given response options of either a positive outcome, such as "You are laughing: it is a water pistol and the weather is fine anyway", or a negative outcome, such as "Oops, this hurts! The pistol produces a red beam which burns your skin!" After the children have chosen an outcome, they are given feedback of whether their decision was correct or incorrect. The training of the interpretation bias was conducted by consistently reinforcing either the threat-related or benign outcomes. Subsequently, children were presented with various ambiguous scenarios that were themed according to everyday situations that could occur on Earth. Results showed that children who received threat-related modification reported greater threat interpretation on the ambiguous scenarios presented at post-test, compared to those who received benign modification (Muris et al., 2008; Muris et al., 2009). However, these studies did not explore whether changes in interpretation bias led to changes in anxiety. Another study using a bias modification paradigm found significant reductions in interpretation bias and social anxiety

symptoms in socially anxious children when they were trained to decrease their threat-related interpretation bias (Vassilopoulos, Banerjee, & Prantzalou, 2009). As a whole, there is evidence that cognitive biases can be acquired or modified, as a recent meta-analysis showed that CBM interventions have a moderate effect on biases in children and adolescents, although the interventions failed to influence their anxiety (Cristea, Mogoase, David & Cuijpers, 2015).

1.8.2 Developmental Models in Information Processing Biases

Field and Lester (2010) argue that adult models do not consider how cognitive, emotional and social development influences information processing biases in childhood and introduce an information processing framework that conceptualizes the role of cognitive development with the following models: (1) the Integral Bias Model, whereby development does not influence threat-related biases, (2) the Moderation Model, in which development moderates the expression of an existing bias, and finally (3) the Acquisition Model, whereby development affects the acquisition of a bias that did not exist previously.

1.8.2.1 The Integral Bias Model.

Field and Lester (2010) suggest that researchers typically adopt the Integral Bias Model, assuming that information processing biases are inherent constituents of emotion that are present from early childhood and remain unaffected by development (Martin et al., 1992; Martin & Jones, 1995). Therefore, the extent to which an individual exhibits threat-related biases is determined by individual factors (e.g. anxiety, temperament) and the degree of processing bias should remain relatively stable across developmental stages.

1.8.2.2 The Moderation Model.

In contrast, Field and Lester's (2010) moderation model proposes that all young children exhibit threat-related biases which may diminish over the developmental period, depending on individual factors such as the development of inhibitory mechanisms or anxiety. Hence, it is possible that different children experience different developmental

trajectories of information processing biases, based on the interplay between individual differences (such as temperament), and cognitive, emotional and social development.

Kindt and van den Hout's inhibition hypothesis is in keeping with the moderation model as it suggests that the development of inhibitory skills is crucial in determining whether children exhibit attentional bias. However, this ability to inhibit attention to threat typically only develops thoroughly around 10 to 12 years of age. They suggest that typically developing children under 10 years of age still lack the ability to inhibit their attention towards threat, indicating a possibility that most young children might demonstrate biases in information processing. Moreover, empirical evidence indicates that compared to low anxious children, those who are highly anxious have not developed the relevant inhibitory skills, which confers risk for the development of anxiety (Kindt & van den Hout, 2001). Therefore, the moderation model suggests that in terms of developmental trajectories, information processing biases diminish with age in non-anxious children, while these biases are maintained or exacerbated as anxious children develop (Field & Lester, 2010).

1.8.2.3 The Acquisition Model.

Lastly, according to Field and Lester's (2010) acquisition model, it is also possible that young children do not exhibit or may not fully exhibit information processing biases towards threat, and specific cognitive, emotional and social skills need to develop before these information processing biases can emerge (see Alfano, Beidel, & Turner, 2002; Manassis & Bradley, 1994; Muris, 2007). Specific to anxiety, there are two propositions relating to the aetiology. First, it is possible that children with trait anxiety (individual factors) have a greater likelihood of acquiring a threat-related bias as they develop. Alternatively, it is also possible that the acquisition of the information processing bias results in the development of anxiety. Therefore, non-anxious children may develop anxiety as a result of acquiring threat-related biases. This latter proposition is consistent with previous

research showing that training on threat-related biases may have a causal effect on the development of anxiety (e.g., Mackintosh et al., 2006; Wilson et al., 2006).

1.8.3 The Role of Learning in the Development of Information Processing Biases

When exploring risk factors that contribute to the development of anxiety, it is particularly important to consider discrete learning experiences, as these are likely to be amendable to change. Based on the acquisition model mentioned above, children may acquire cognitive biases through learning experiences. For example, there is emerging evidence suggesting that children may acquire information processing biases from their parents (Drake & Ginsburg, 2012; Hadwin et al., 2006). A growing body of research suggests that children and their parents show similar patterns of threat interpretation (Bögels, van Dongen, & Muris, 2003; Creswell & O'Connor, 2006; Creswell, Schniering, & Rapee, 2005; Creswell, Shildrick, et al., 2011), although several studies did not find this association (Creswell et al., 2006; Gifford, Reynolds, Bell, & Wilson, 2008). Consistent with the intergenerational transmission hypothesis, a series of studies indicate that both parents and children tend to make overlapping interpersonal threat interpretation. Lester, Field, Oliver and Cartwright-Hatton (2009) found that anxious parents extend their interpretation bias to situations involving their children. Likewise, children's interpretation bias is significantly associated with their prediction of how their mothers would disambiguate situations for them (Lester, Seal, Nightingale, & Field, 2010).

When considering the process through which parents might affect their children's bias, it is useful to draw upon Rachman's (1977, 1991) three routes through which fears and phobias can be learnt: classical conditioning, modelling/vicarious learning, and the transmission of verbal threat information. The classical conditioning model forms the basis of many contemporary theories of fear acquisition, and a large body of evidence from experimental and real-world studies has validated this as a potential causal pathway to fear development (see Davey, 1997; Field, 2006; Mineka & Zinbarg, 2006; Öhman & Mineka,

2001). Second, the modelling or vicarious learning pathway refers to the acquisition of fear via observing others' fearful reactions to a particular stimulus or situation. There is a wealth of evidence from over 40 years of experimental research in adults and children supporting vicarious learning as a pathway to fear acquisition (see Askew & Field, 2008, for a review). Finally, the last route for fear acquisition as proposed by Rachman (1977, 1991) is through the transmission of verbal threat information, whereby fear is acquired through hearing or reading about a stimulus or situation that might be threatening. Rachman (1977, p.384) argued that the transmission of verbal threat information from parent to child in particular, is relevant when exploring the development of childhood fears and phobias: "Information-giving is an inherent part of child-rearing and is carried on by parents and peers in an almost unceasing fashion, particularly in the child's earliest years. It is probable that informational and instructional processes provide the basis for most of our commonly encountered fear of everyday life" (see Muris & Field, 2010, for a review). It is important to note that these three pathways to fear acquisition do not operate in isolation in real-life situations. Yet, it is important for research to examine these pathways individually to gain a clearer understanding of how each pathway contributes to the acquisition of fear and anxiety.

1.8.3.1 Effects of Verbal Threat Information on Children's Fear Beliefs and Cognitive Biases

In an attempt to investigate the causal role of the transmission of verbal threat information in fear acquisition in children, Field, Argyris, and Knowles (2001) developed an experimental procedure allowing the effects of verbal threat information to be examined under controlled conditions. In two experiments, the authors presented children (aged 7 to 9 years) with either positive or negative information regarding a monster doll that was unknown to them. This initial paradigm successfully demonstrated that when children were presented with verbal threat information regarding a stimulus, their fear-beliefs would increase, while the reverse would occur if they were presented with positive information.

Following that, many subsequent studies have also adopted and extended this basic experimental paradigm.

According to a systematic review by Muris and Field (2010), a total of 17 research articles have been published at the time, discussing the effects of verbal threat information on childhood fear in a total of 22 experiments (see Muris and Field, 2010 for details of the studies). All of these studies involved community samples of children and used self-report measures of fear beliefs to assess children's fear towards novel animals, monster dolls or social situations. When children were presented with threatening information about a stimulus or situation, the majority of studies (88.9%) indicated an increase in fear beliefs. Besides that, most studies (71.4%) also showed a decrease in children's fear beliefs when they were presented with positive information. Finally, when children in these studies were not provided with any information regarding the stimulus or situation, their fear beliefs remained largely unchanged (90%). Based on this evidence, Muris and Field (2010) concluded that self-report data indicated that fear acquisition in children can be reliably manipulated via verbal information.

In addition to fear beliefs, a number of studies have shown that verbal information can affect cognitive processes associated with anxiety, including attentional bias (Field, 2006), confirmation bias (Muris, Rassin, et al., 2009) and covariation bias (Field & Lawson, 2008). For instance, in investigating the effects of verbal threat information on attentional bias, Field (2006) conducted two experiments whereby children (aged 6 to 9 years) were presented with threatening, positive or no information regarding novel animals before completing a pictorial dot probe task (see above description in Section 1.7.1.1) to measure attentional bias. In both experiments, children responded faster to dot probes preceded by pictures of the animal in which negative information has been given, compared to dot probes preceded by pictures of animals in which positive or neutral information had been given (Field et al., 2006) indicating that threatening information can induce an attentional

bias in children. Furthermore, Muris et al. (2009) demonstrate that threat information affects fear-related confirmation bias in children (aged 9 to 12 years). In brief, they found that negatively valenced information could increase children's tendency to search for information that supports a threat-related view of the stimulus. Moreover, threat information has also been found to affect covariation bias in children (7 to 9 years and 9 to 12 years respectively) (Field & Lawson, 2008; Muris et al., 2009). Children were more likely to overestimate the association between threat-related stimuli and negative outcomes after being exposed to threat information.

Additionally, researchers have also successfully demonstrated the causal role of verbal threat information on more automatic fear cognitions in children using implicit tasks such as the Implicit Association Task (IAT; Greenwald, McGhee, & Schwartz, 1998) and the Affective Priming Task (Fazio, 1986). In a series of experiments, Field and colleagues (Field & Lawson, 2003; Field, Lawson, & Banerjee, 2008; Lawson, Banerjee, & Field, 2007) found that children exposed to threatening information regarding novel animals (Australian marsupials such as quoll, quokka, and cuscus) were more likely to associate these animals with negative words compared to the positive ones, indicating stronger memory associations with threatening concepts.

Researchers have also found evidence for the effects of verbal information on children's physiological and behavioural response systems. For instance, in studies investigating the effects of verbal information on children's heart rate as a physiological measure of fear, children (aged 6 to 9 years) were presented with threat, positive or no information regarding three novel animals (e. g. Australian marsupials). Subsequently, children's average heart rate was measured while they completed the Touch Box Task (Field & Lawson, 2003), whereby they were required to insert their hand into a box that they falsely believed to contain the novel animals. Results indicated that children who were given threatening information regarding the novel animals had significantly higher heart rates

when they approached the box, compared to those who were presented with positive information or no information regarding the animals (Field & Price-Evans, 2009; Field & Schorah, 2007). Similarly, studies (Field & Lawson, 2003; Field, Joanne Lawson, et al., 2008; Kelly, Barker, Field, Wilson, & Reynolds, 2010) investigating behavioural response also use the Touch Box Task. These studies have shown that children who received threat information regarding the novel animals consistently took longer to insert their hands into the box, reflecting behavioural avoidance. Moreover, Field and Storksen-Coulson (2007) have also demonstrated behavioural avoidance in children presented with verbal threat using the Nature Reserve Task, whereby the Lego figure representing themselves was placed further away from photographs of the novel animals, compared to those given positive or no information.

The studies discussed above demonstrate the immediate effects of threat information in promoting fear in children. However, due to the emerging nature of this field, very few studies have explored the sustained effects of verbal threat information. In the first study to examine longer-term effects, Muris, Bodden, Merckelbach, Ollendick and King (2003) showed that immediately after the experimental manipulation, threatening information increased children's fear beliefs while positive information decreased it. More importantly, at 1-week follow-up, the fearful children maintained elevated levels of fear beliefs while those who were less fearful maintained their lower levels of fear beliefs, indicating the prolonged effects of verbal information on fear in children. In a more recent study by Field, Lawson and Banerjee (2008), an extended follow-up period was adopted to investigate the long-term impact of verbal information in children (aged 6 to 8 and 12 to 13 years). Children's fear beliefs appeared to be fairly consistent at 1-week, 1-month and 3-month follow-up, and even persisted up to 6 months after the experimental manipulation.

As a whole, there is substantial evidence suggesting that verbal threat information is a viable pathway in the development of fear and anxiety-related cognitions in children. As

mentioned previously (see Section 1.8.3), research suggests that children may acquire anxiety-related cognitions from their parents. There is some evidence that this intergenerational transmission of anxiety-related cognitions occurs via the verbal information pathway (Drake & Ginsburg, 2012; Hadwin et al., 2006). Early research has found that parental narratives affect children's anxiety-related responses (Barrett et al., 1996; Chorpita & Albano, 1996; Dadds, Barrett, Rapee, & Ryan, 1996). For instance, in Barrett et al.'s (1996) study, parents were instructed to discuss ambiguous scenarios with their children (aged 7 to 14 years) to help them generate plans of actions for those scenarios. Results demonstrated the first evidence of the Family Enhancement of Aggressive or Avoidance Responses (FEAR) effect in children. It was found that family discussions enhanced anxious children's existing avoidant action plans. In contrast, oppositional children's action plans became more aggressive, while non-anxious children adopted a more proactive action plan following family discussions. In a related study, Dadds et al. (1996) found that parents of anxious children had a greater tendency to reward their children's avoidant responses by providing more avoidant responses themselves and showing greater enthusiasm when their children suggested avoidant plans. Likewise, Chorpita et al. (1996) found that high trait anxiety in children was associated with greater threat interpretations and enhanced avoidant plans following family discussion. However, other studies have found no evidence for the FEAR effect in children (Bogels et al., 2003; Cobham et al., 1999).

In line with the above, Field, Lester and Cartwright-Hatton (2008) found parental trait anxiety to be associated with the level of threat in the verbal information communicated to their children (aged 6 to 10 years), although the strength of the correlation was rather modest. More recently, Muris, van Zwol, Huijding and Mayer (2010) found that mothers who received threat information about unknown animals instilled greater fear beliefs in their children (aged 8 to 13 years) by communicating more threatening narratives about the animals than mothers who received positive information.

More importantly, for mothers who received ambiguous information regarding the unknown animals, the transmission of fear was dependent of their level of trait anxiety. Parents with higher levels of trait anxiety communicated more threatening stories to their children, therefore instilling greater levels of fear in their children (Muris et al., 2010). It is possible that anxious mothers displayed an interpretation bias, therefore when they were presented with ambiguous information, the information was interpreted as threatening, which was then communicated to their children. Hence, these preliminary findings suggest that parents may play an important role in the acquisition of childhood fears via the transmission of verbal threat information.

1.9 The Current Project

In this review of the literature, theory and research relating to the development of elevated anxiety and anxiety disorders has been briefly outlined. It is clear that pathways to anxiety are multiply determined and complex. Research on information processing biases suggests that biases, particularly attentional and interpretation bias might be important in the development of anxiety (Mathews & MacLeod, 2005; Muris & Field, 2008). However, to date, research has yet to establish the origins of these biases. The acquisition model of information processing biases (Field & Lester, 2010) suggests that biases can be learned, which is consistent with research showing that biases can be acquired via verbal information (Muris & Field, 2010), as well as cognitive bias modification work showing that biases towards threat can be trained (Mathews & Mackintosh, 2000; Wilson et al., 2006; Muris, Huijding, Mayer, & Hameetman, 2008; Muris, Huijding, Mayer, Remmerswaal, & Vreden, 2009).

The research conducted for this thesis is grounded on the acquisition model (Field and Lester, 2010) and aims to explore whether interpretation bias and fear beliefs might be learned from significant others within close relationships (i.e., parents, friends and romantic partners). Currently, research in this area has predominantly focussed on the parent-child

relationship (e.g., Barrett et al. 1996; Creswell et al., 2011). Dibble, Levine, and Park (2011) define relational closeness as the degree of mutual interdependence (affective, cognitive and behavioural) between two individuals, which includes the frequency and strength of impact those individuals have on one another. In fact, they argue that even though different forms of relationships may experience and enact closeness in different ways, closeness transcends relationship types. This suggests that besides parent-child relationships, individuals in other forms of close relationships may also exert some level of influence on each other. Following this reasoning, individuals in close peer and romantic relationships may also exhibit patterns of shared interpretation bias and their threat-related bias may be affected by verbal information from their friends and/or partners. Further, Bowlby (1973) proposed that the internal working models formed during early experiences with parents also play a role in shaping the internal working models of other close relationships later in life, such as friendships or romantic relationships. As such, besides examining the transfer of anxious cognitions from parents to children, it seems fitting to examine whether other sources of attachment figures across development, such as close friends and romantic partners might also play a role in the transmission of such cognitions.

The research also considers a range of developmental stages to identify potential sources of influence that may play a role in the acquisition and/or maintenance of information processing bias across development. First, it aims to extend research on the intergenerational transmission of biases to early childhood, as existing work has predominantly focused on middle to late childhood even though evidence suggests that a significant proportion of preschool-aged children suffer from anxiety disorders (Egger & Angold, 2006). Additionally, this research will explore the transmission of anxiety-related cognitions between close friends in middle childhood as peers become increasingly influential over children's thoughts and behaviours at this developmental stage (Schunk, 1987; Schunk & Hanson, 1985). Finally, it will also examine whether individuals in young

adulthood acquire anxious cognitions from significant others as this developmental stage has been identified as a risk period for the onset of several psychological disorders, including anxiety (Newman et al., 1996).

1.9.1 Outline of Studies

The thesis aims are realised across four studies that explore shared anxiety-related cognitions (interpretation bias or fear beliefs) in distinct close relationships. The following section provides a brief overview of each study.

1.9.1.1 Study 1: Shared Cognition in Childhood Anxiety: Interpretation Bias in Preschool Children and their Parents.

Research examining the intergenerational transmission of interpretation bias has predominantly focussed on middle to late childhood (e.g., Barrett et al., 1996; Creswell et al., 2005, Muris et al., 2010), with early childhood not considered. Based on the acquisition model of information processing, Field and Lester (2010) suggest that early childhood (aged 4 –7) may be an important developmental period for learning interpretation bias. Given that parents have the most influence over their young children, it seems plausible that young children may learn maladaptive thinking styles from their parents via verbal information transfer. Therefore, examining the intergenerational transmission of interpretation bias in younger children may shed light on the early development of this bias.

Study 1 examines whether young children's trait anxiety is associated with their interpretation bias, measured using a story-stem paradigm (Dodd et al., 2012), and whether they share similar patterns of interpretation bias with their parents. Additionally, this study also examines whether parents' trait anxiety is associated with their tendency to end written stories in an threatening manner, and whether children's interpretation bias is associated with their parents' written story endings.

1.9.1.2 Study 2: The Effects of Peer Discussion: Do Close Friends Influence Each Other's Fearfulness?

As mentioned above, a growing body of evidence suggests that children may acquire anxiety-related cognitions from their parents (Drake & Ginsburg, 2012, Hadwin et al., 2006). In keeping with research on intergenerational transmission, it is likely that anxiety-related cognitions are also transmitted in other forms of close relationships. In middle childhood, peers become an increasingly influential source of information about the environment alongside parents (Schunk, 1987). Therefore, as children in close friendships tend to interact frequently, it is plausible that close friends may also play a role in influencing each other's anxiety-related cognitions. Study 2 explores whether close friends in middle childhood share similar patterns of fear responses (fear beliefs and avoidance behaviours) with each other. Additionally, this study also explores whether a discussion between close friends influences children's fear responses.

1.9.1.3 Study 3: Do Romantic Partners Affect Each Other's Cognition?

Based on a similar framework to Study 2, it is also likely that anxiety-related cognitions are transmitted in other forms of close relationships in young adulthood, besides the parent-child relationship. Romantic relationships are important in young adulthood, and as young adult partners interact with each other regularly, they may also influence each other's interpretation bias. Therefore, Study 3 aims to explore whether young adult couples share similar patterns of threat interpretation, and whether they influence each others anxiety-related cognitions following a discussion together.

1.9.1.4 Study 4: Shared Cognition in Anxiety: Interpretation Bias in Young Adults and their Parents.

Although anxiety disorders are the most prevalent psychological disorders in young adulthood (Kim-Cohen et al., 2003), little research has been done to explore the origins of anxiety-related cognitions at this developmental stage. Evidence suggests that parent-child

interactions tend to show continuity over time from childhood to young adulthood (Aquilino, 1997; Rossi & Rossi, 1990; Whitbeck, Hoyt, & Huck, 1994) and, as parents remain an important source of support for their children in young adulthood (Da Vanzo & Goldscheider, 1990), it is likely that they continue to exert some influence on their child's interpretation bias even when they are young adults. Following on from work in Study 1, Study 4 examines whether young adults share similar patterns of threat interpretation with their parents.

1.9.2 Overarching Hypotheses of the Thesis

As a whole, two main overarching hypotheses are examined in this thesis. First, that interpretation bias/fear responses in individuals in close relationships will be significantly correlated, indicating that individuals in close relationships (i.e., parents and children, friends and romantic couples) share similar anxiety-related cognitions. Second, that individuals in close relationships will influence each other's anxiety-related cognitions.

Chapter 2

Study 1: Shared Cognition in Childhood Anxiety: Interpretation Bias in Preschool

Children and their Parents

Published in the Journal of Child and Family Studies (Refer to Appendix 1)

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Declaration: The candidate was the primary author of this chapter, collected all of the data, coded the data as primary coder, trained the reliability coder, conducted the analysis and wrote the paper for this research. Helen Dodd and Judi Walsh supervised the project and gave feedback and editorial advice on the write-up of this chapter. The University reserves the right to contact the other authors to verify the relative contributions.

Abstract

Although interpretation bias has been associated with the development and/or maintenance of anxiety, its origins remain unclear. The present study is the first to examine the potential intergenerational transmission of this bias from parents to their preschool-aged children via parental story-telling. A community sample of 50 parent-child pairs was recruited. Parents completed measures of their own trait anxiety and interpretation bias, their child's anxiety symptoms, and a written story-stem measure, to capture the way parents tell their children stories. Interpretation bias was assessed in preschool-aged children (aged between 2 years 7 months and 5 years 8 months) using an extended Story-stem Paradigm. Young children's interpretation bias was not significantly associated with their own anxiety symptoms. Neither was there evidence for a significant association between parent and child interpretation bias or between parent anxiety and the number of stories they ended in a threatening way. However, a significant positive association was found between the number of stories parents ended in a threatening way on the written stories measure and their child's interpretation bias. There was some indication that this effect was stronger for younger children than older children. The results suggest that parental verbal information via storytelling could play a role in the development of interpretation bias in young children.

Introduction

Childhood anxiety disorders are the most prevalent psychological disorders in preadolescent children, with approximately 3-5% of children younger than 12 years meeting criteria for an anxiety disorder at any given time (Cartwright-Hatton, McNicol, & Doubleday, 2006). A recent review (Simon, van der Sluis, Muris, Thompson, & Cartwright-Hatton, 2014) suggested that anxiety in preadolescent children has a negative impact on quality of life, predicting subsequent social and scholastic incompetence in adolescence (Bosquet & Egeland, 2006), non-completion of schooling (Duchesne, Vitaro, Larose, & Tremblay, 2008), and lower adaptive functioning (Ialongo, Edelsohn, Werthamer-Larsson, Crockett, & Kellam, 1995). In addition, evidence also suggests that anxiety in early childhood is a major risk factor for subsequent anxiety, as well as other mental health problems later in life, such as aggression (Dallaire & Weinraub, 2007), affective disorders (Clark, Rodgers, Caldwell, Power, & Stansfeld, 2007), and oppositional-defiant disorder (Bufferd, Dougherty, Carlson, Rose, & Klein, 2012). Young children's anxiety problems tend to persist in the absence of any intervention and early treatment is therefore crucial (Simon et al., 2014).

In exploring the origins of childhood anxiety, previous research has shown that anxious parents are more likely to have an anxious child than non-anxious parents (Mancini, van Ameringen, Szatmari, Fugere, & Boyle, 1996; Weissman, Leckman, Merikangas, Gammon, & Prusoff, 1984). About one third of this relationship is accounted for by genetics (Gregory & Eley, 2007), leaving a significant role for the environmental effects of having an anxious parent (Creswell, Cooper, & Murray, 2010; Hadwin et al., 2006). One way in which parental anxiety might have an environmental effect on children's anxiety is via the intergenerational transmission of biased thinking styles. Interpretation bias refers to a tendency to disproportionately interpret ambiguous situations as threatening (Field, Hadwin, & Lester, 2011; Hadwin, Garner, & Perez-Olivas, 2006). This bias may play a role in the onset, and/or maintenance of childhood anxiety disorders (Creswell & O'Connor, 2011;

Dodd, Hudson, Morris, & Wise, 2012; Vassilopoulos, Banerjee, & Prantzalou, 2009; Warren, Emde, & Sroufe, 2000), and it has been hypothesised that anxious parents may inadvertently transfer their interpretation bias to their child via verbal communication (Creswell et al., 2010; Hadwin et al., 2006).

A growing body of research suggests that children and their parents show similar levels of threat interpretation (Bögels, van Dongen, & Muris, 2003; Creswell & O'Connor, 2006; Creswell, Schniering, & Rapee, 2005; Creswell, Shildrick, & Field, 2011), although there is some inconsistency, with other studies failing to find an association (Creswell, O'Connor, & Brewin, 2006; Gifford, Reynolds, Bell, & Wilson, 2008). In accordance with the intergenerational transmission hypothesis, it has been proposed that the transfer of verbal information is one pathway by which interpretation bias may be transmitted from parents to children (Field & Lester, 2010; Hadwin et al., 2006; Muris & Field, 2010). Early research has found that parental verbal information affects children's interpretation bias and/or anxiety-related responses (Rapee, Dadds, & Ryan, 1996; Chorpita & Albano, 1996; Dadds, Barrett, Rapee, & Ryan, 1996). For instance, parents' anxious verbal information enhanced children's interpretation bias and avoidant responses following family discussions of ambiguous scenarios (Chorpita & Albano, 1996), although other studies have failed to replicate this effect (Bögels et al., 2003; Cobham, Dadds, & Spence, 1999).

Furthermore, the nature of verbal information communicated by parents seems to be affected by parental anxiety. Field, Lester, and Cartwright-Hatton (2008) found that when parents were presented with an equal amount of positive, negative, and neutral information about novel animals, their trait anxiety was associated with the level of negativity in the verbal information communicated to their children. Consistent with the above, Muris, van Zwol, Huijding, and Mayer (2010) found that when mothers received ambiguous information about unknown animals, their level of trait anxiety determined the transmission of fear beliefs to their children. Specifically, parents with higher anxiety communicated more

threatening stories that in turn instilled greater fear beliefs in their children. Therefore, there is emerging evidence suggesting a potential pathway whereby parental anxiety affects the amount of threat they communicate to their children, which in turn affects their children's interpretation bias (Muris & Field, 2010; Murray, Creswell, & Cooper, 2009). It is possible that this transfer of verbal information may play a role in the intergenerational transmission of anxiety, or at least cognitive biases.

To our knowledge, all of the literature examining the intergenerational transmission of interpretation bias has focused on middle to late childhood, with early childhood not considered. As parents have most influence over their children's lives in early childhood (Fox, Henderson, Marshall, Nichols, & Ghera, 2005) and this is a period when children are learning rapidly, it seems possible that children may be particularly affected by information given to them by their parents at this age. Thus, extending intergenerational transmission of bias research to younger children may be important for understanding the early development of biases.

As the methods used with older children and adults are not developmentally appropriate for young children, there is a dearth of research examining maladaptive anxiety-related cognitions in young children more broadly. Recent research has begun exploring this crucial gap in the field by piloting a novel story-stem methodology to assess preschool children's interpretation of ambiguous stories (Dodd, Hudson, Morris & Wise, 2012). In this study, 131 children aged between 3 years 2 months and 4 years 5 months completed the Story-stem Paradigm by finishing three ambiguous story-stems that were presented to them, with the use of dolls and props. The results showed that clinically anxious young children were more likely to give threat-related endings to the stories than non-anxious young children. However, the cross-sectional relationship between interpretation bias and child anxiety symptoms, as reported by parents, was not significant. Longitudinal follow-up provided some suggestion that interpretation bias, as assessed using the Story Stem

Paradigm, may predict anxiety symptoms over time, with a significant association found with anxiety symptoms at 12-month follow-up but not at two year or five year follow-up. As Dodd et al.'s (2012) research relied on just 3 story-stems, the authors acknowledged the need to extend the number of ambiguous stories to increase the sensitivity of the task to detect potential individual differences in young children's interpretation bias.

The present research had four principal aims: (1) to examine the association between anxiety and interpretation bias in young children using an extended version of the Story-stem Paradigm used by Dodd et al. (2012); (2) to investigate whether parents and their preschool-aged children share similar levels of threat interpretation; (3) to examine whether parental trait anxiety affects parent's tendency to end written stories for their children in a threatening way; and (4) to assess whether young children's interpretation bias is associated with parents' written story endings. The hypotheses evaluated were: (H1) young children's interpretation bias will be significantly related to their anxiety symptoms, (H2) parents and their children's interpretation bias will be significantly correlated; (H3) parents with higher levels of trait anxiety will end more of their written stories in a threatening way; and (H4) young children's interpretation bias will be significantly correlated with the number of parent written stories that end with threat.

Method

Participants

Participants were a community sample of 50 children (26 boys) aged 2 years 7 months to 5 years 8 months (Mean age = 4 years, $SD = 6$ months) and their parents (mean age = 35 years, $SD = 5$ months) (45 mothers and 5 fathers). Participants volunteered to take part after hearing about the study via letters and advertising at local preschools and parent-toddler groups, the university's e-bulletin and via friends who had also taken part. A total of three hundred leaflets about the study were distributed at the preschools and parent-toddlers groups. Children with any identified developmental disorders were excluded from the study. In this sample, 94% of children lived with both parents, most of whom identified

as white British (90%). The majority of parents were either working part-time (46%) or at home by choice (38%), while 10% were working full-time. The majority of families (64%) reported an above average net household income of £35000 and above, while 18% reported a net household income of £15000 and under. The majority of parents had completed post-school qualifications (90%).

Measures

Child anxiety symptoms. Parents completed the Revised Preschool Anxiety Scale (PAS-R; Edwards, Rapee, & Kennedy, 2010), which assesses anxiety symptoms in young children. The measure has good construct validity, and strong internal consistency, test-retest reliability and cross-informant reliability (Edwards et al., 2010). Internal consistency for the total score in this sample was Cronbach's alpha = .89.

Parental anxiety symptoms. Parents completed the trait subscale (STAI-T) of the State-Trait Anxiety Inventory, Form Y-2 (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The STAI-T is a 20-item self-report measure that assesses "relatively stable individual differences in anxiety proneness and refers to a general tendency to respond with anxiety to perceived threats in the environment" (Spielberger, Gorsuch and Lushene, 1970, p.3). The STAI-T has relatively high concurrent validity with other measures of anxiety, ranging from .73 - .85, and strong internal consistency and good test-retest reliability (Spielberger et al., 1983). Internal consistency for this sample was Cronbach's alpha = .92.

Child interpretation bias. A story-stem methodology was used to assess children's interpretation bias. This methodology has been used in previous research (Dodd et al., 2012) and has demonstrated reasonable success in assessing interpretation bias in young children aged between 3 years 2 months and 4 years 5 months. In the present research, eight ambiguous story-stems (refer to Appendix 2) were presented to the children and they were asked to complete the story stems verbally, with the help of dolls and additional props. Children's responses were coded using the coding scheme described below. To ensure that

the stories captured the range of anxiety typically experienced by young children, stories were selected and constructed based on themes of physical threat, social threat and separation anxiety. The story stems were designed to be ambiguous and to allow for interpretation as either threatening or non-threatening. From the total of eight stories (four physical, two social and two separation), two were adapted from Dodd et al.'s (2011) study, two were adapted from previous research examining interpretation bias in older children (Barrett, Rapee, Dadds & Ryan, 1996), and four were created for the purposes of this research. To ensure the ambiguity of the story stems, six adult independent raters rated the stories using a 7-point Likert scale ranging from -3 (no threat) to +3 (threat), with a score of 0 indicating ambiguity in the story stems. The ratings reflected ambiguity for all the 8 story stems, with an overall mean of .08 ($SD = .65$).

Parent Written Stories (Verbal Information). To examine the way parents communicated with their children about ambiguous situations, the 8 story-stems described above were also included as a written story-stem measure, which asked parents to complete the stories according to how they would tell each one to their child. The responses were coded by the researcher based on the coding scheme described below.

Parental interpretation bias. To measure parents' own interpretation bias, parents completed an interpretation bias measure consisting of 12 ambiguous scenarios (refer to Appendix 3); half the scenarios described social situations (e.g. "You're giving a speech. People in the audience start laughing, why?"), while the other half described non-social situations (e.g. "Your stomach starts to feel a bit funny on your way into work, why?"). Parents were instructed to imagine that they were experiencing each scenario and to write their interpretation of the scenarios on the questionnaire. Their responses were coded using the same coding scheme described below. The scenarios were adapted from Barrett et al. (1996) and Wisco and Nolen-Hoeksema (2010), and were developed in consultation with experts in the area. To ensure the scenarios were ambiguous, 13 independent adult raters

rated the stories using a 7-point Likert scale ranging from -3 (no threat) to +3 (threat), with a score of 0 indicating ambiguity in the story stems. The ratings reflected ambiguity for all the 12 ambiguous scenarios, with an overall mean rating of $-.13$ ($SD = 1.09$).

Procedure

The School of Social Work and Psychology Research Ethics Committee at the University of East Anglia approved the methods of the study. The 1-hour experimental sessions were conducted either at participants' homes or the University, depending on the parent's preference. Parents provided written informed consent for themselves and their children, while the children provided verbal assent to the procedure of the study. During the session, the parents completed the questionnaires outlined above in a separate room while the children completed the Story-stem Paradigm, which was video-recorded. Families were thanked for their time and a small gift was given to the children.

Coding

For the three interpretation bias measures (child story-stems, parent interpretation bias measure, and parent written story-stem measure) participants' response to each story/scenario was coded individually for the presence of threat or danger (threat interpretation). A score of 1 was assigned when an interpretation was threatening and a score of 0 was assigned when no threat was present in the interpretation. Items were coded as 'missing' if the responses were ambiguous/unclear, irrelevant to the specific story-stem, or if there was non-response/non-compliance from the participants. To ensure that scores were comparable across participants, mean scores were calculated for each measure, as long as that participant had data available for at least 80% of the scenarios on the relevant measure. Thus, data were not included in the analyses for any measures where participants had missing data on more than 20% of the scenarios. More details on the coding and specific examples of responses coded as threat, non-threat and missing for each measure are provided in Appendix 4. The first author coded data from all three measures for the 50

parent-child pairs (400 stories for children's story-stems, 400 stories for the written story-stem measure, and 600 scenarios for the parent interpretation bias measure) but was blind to which measures came from the same parent or parent-child pair. To check for reliability, a second coder also coded data from all the three measures for 25% (13 parent-child pairs) of the randomly selected participant pairs (104 stories for children's story-stems, 104 stories for the written story-stem measure, and 156 scenarios for the parent interpretation bias measure).

Child interpretation bias. Out of a possible total of 400 stories, 115 (29%) were coded as threat interpretation, 234 (58%) were coded as non-threat, while 51 (12%) were coded as missing data. Twelve children (24%) had missing data on more than 20% of stories, so no score was calculated for these participants. Missing data were due to child task refusal and ambiguity in responses from the children. Inter-rater reliability for children's total threat interpretations was ICC (2,1) = .99.

Parental Written Stories (Verbal Information). Out of a total of 400 stories, 48 (12%) were coded as threat interpretation, 348 (87%) were coded as non-threat, while 5 (1%) were coded as missing data. One parent (2%) had missing data on more than 20% of the stories, so no score was available for that participant. Missing data were due to non-response from parents. Inter-rater reliability for the written story-stem measure was ICC (2,1) = .76.

Parental interpretation bias. Out of a total of 600 stories, 136 (23%) were coded as threat interpretation, 463 (77%) were coded as non-threat, while 1 (.17%) was coded as missing. Missing data were due to non-response from parents. There were no participants with missing data on more than 20% of the scenarios. Inter-rater reliability for parental interpretation bias was ICC (2,1) = .78.

Results

Data Preparation

All the variables described above were normally distributed, except for parents' written stories. There was a significant positive skew in the distribution of responses, all analyses involving this variable were therefore bootstrapped, and estimates using 1000 bootstrapped samples are reported. Using a criterion-based z-score methodology, no outliers were identified.

The level of trait anxiety symptoms for both the parents and their children was explored. Independent samples *t* tests were conducted to examine differences between the means and standard deviations from the normative data and that of the present sample. Parents' anxiety scores ($M = 37.78$, $SD = 9.08$, $N=50$) were slightly higher than Spielberger et al.'s (1983) normative sample of working adults ($M = 34.79$, $SD = 9.22$, $N=451$), $t(499) = 2.17$, $p = .02$, $d = .19$. In contrast, the children's anxiety scores in this sample ($M=30.94$, $SD = 15.04$, $N=50$) were significantly lower than Edwards et al.'s (2010) normative sample of young children ($M = 38.40$, $SD = 19.00$, $N = 764$), $t(812) = 2.72$, $p = .01$, $d = .19$.

There were no significant group differences on age, gender or anxiety between children with complete total interpretation bias scores ($N = 38$) and those with incomplete data ($N = 12$), $t(46) = .73$, $p = .47$, $d = .10$; $\chi^2(1) = .25$, $p = .61$, $\phi = .02$; $t(48) = 1.70$, $p = .09$, $d = .49$. Note however, that the p-value for anxiety approached significance suggesting that the participants with complete interpretation bias data may have been slightly more anxious than those with incomplete data. To ascertain whether the children with missing data may have differed on their interpretation bias, we compared children who had completed more than half of the story-stems but not enough for a mean score to be computed (5 or 6 stories) ($N = 8$) with those for whom a mean score was available. No significant differences were found, $t(8.25) = -1.01$, $p = .34$, $d = -0.70$. We did not include participants who had only

completed 4 or less story-stems in this analysis, as we did not feel we could make any valid inference about what their total score might have been.

Lastly, as two of the children in the present sample were younger than 3 years (2 years 7 months and 2 years 11 months), the analyses below were first conducted by including all the children in the sample and another by excluding those below three years. Findings from both sets of analyses were comparable so these children are included.

Hypothesis Testing

To investigate the hypotheses in the present study, Pearson's correlations were conducted first between young children's interpretation bias and their anxiety symptoms (H1), and second between parent and child interpretation bias (H2). No significant association was found between young children's interpretation bias and their anxiety symptoms, $r = -.03$, $p = .83$. There was a small negative relationship between parent and child interpretation bias, but this was not statistically significant, $r = -.25$, $p = .13$.

Bootstrapped Pearson's correlations were conducted between parental trait anxiety and parent written stories (H3), followed by parent written stories and children's interpretation bias (H4). No significant association was found between parental trait anxiety and parent written stories, $r = .13$, $p = .37$. There was a significant relation between parent written stories and children's interpretation bias, $r = .37$, $p = .02$. To explore this further, we examined whether parent written stories might be associated with child anxiety levels but no significant association was found, $r = .15$, $p = .30$.

The moderating effect of age and gender

To examine whether the above findings were moderated by age and/or gender, exploratory analyses were conducted using multiple regression. For each hypothesis, a regression model was constructed that mirrored the relevant correlation above but also included age and gender as predictor variables. All two and three-way interactions were also included. Thus, dependent variables were as follows: Child anxiety (for H1); child

interpretation bias (for H2); parent written stories (for H3); children's interpretation bias (for H4). For H1, H2 and H3 the regression models were not significant, $p > .05$. For H4, the regression model including all predictors and interactions was significant, $F(7,27) = 3.85$, $MSE = .15$, $p = .01$, $R^2 = .50$. Examination of the coefficients indicated significant main effects of parent written stories, $b = 19.92$, $SE = 6.46$, child gender, $b = 1.65$, $SE = .72$, child age, $b = .07$, $SE = .02$, significant interactions between parent written stories and child age, $b = -.38$, $SE = .14$, parent written stories and child gender, $b = -9.35$, $SE = 4.04$, child age and child gender, $b = -.03$, $SE = .01$, and parent written stories, child age, and child gender, $b = .18$, $SE = .08$. To explore the three-way interaction, bootstrapped Pearson's correlations were conducted between parent written stories and child interpretation bias for the following 4 groups: 2-3 year old boys, 2-3 year old girls, 4-5 year old boys, and 4-5 year old girls. Large correlations were found for girls aged 2-3 years, $r = .93$, $p = .00$, and for boys aged 2-3 years, $r = .56$, $p = .19$, although the latter did not reach significance, the analysis is very underpowered. For both boys and girls aged 4-5 years, there was little evidence of an association between parent stories and child bias, $r = -.05$, $p = .88$, $r = .16$, $p = .69$, respectively. These associations can be seen in Figure 1.

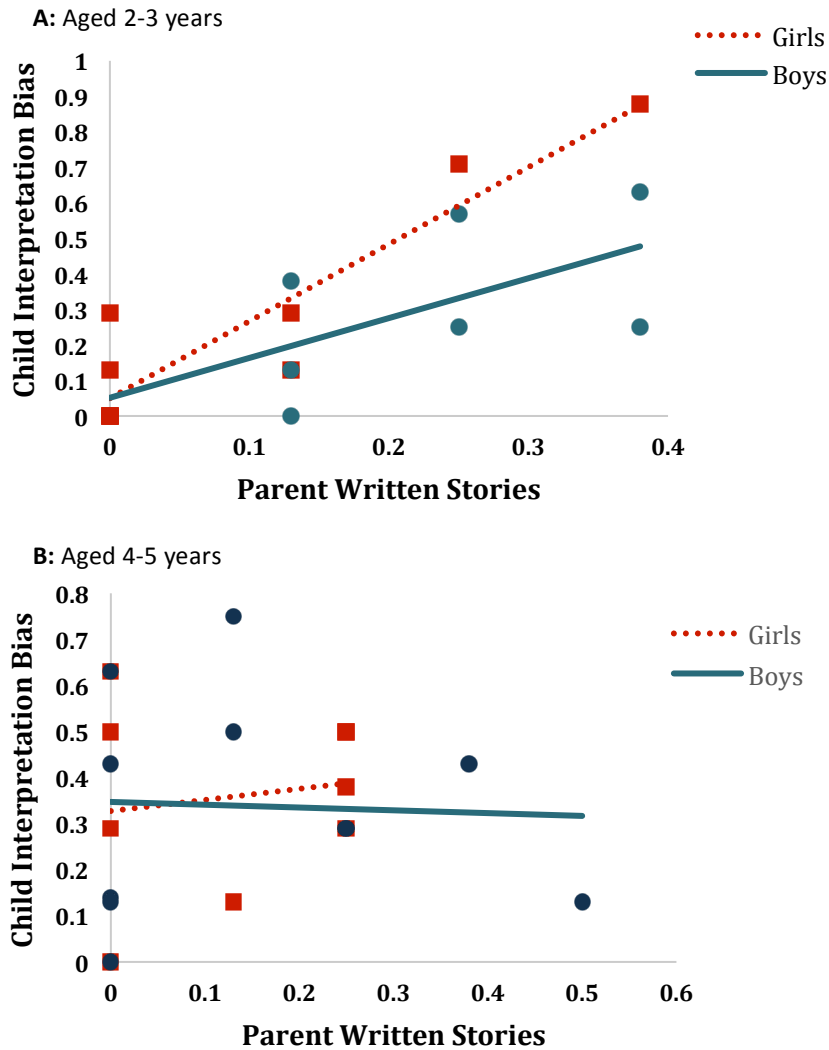


Figure 1. Possible moderating effects of child age and gender on parent written stories and child interpretation bias. A: Children aged 2-3 years. B: Children aged 4-5 years.

Discussion

There is some evidence that school-aged children exhibit similar levels of interpretation bias as their parents (e.g., Barrett et al., 1996; Creswell et al., 2011), and that this bias might be transferred from parents to their children via threatening verbal information (Field et al., 2008; Muris et al., 2010). The present study represents the first attempt to explore whether this intergenerational transfer of interpretation bias might also occur in preschool-aged children.

First, the present study attempted to replicate and extend Dodd et al.'s (2012) baseline findings in a typically developing population. Contrary to the first hypothesis, there was no significant relationship between young children's interpretation bias and their anxiety symptoms. Although Dodd and colleagues found a significant association between interpretation bias and clinical anxiety, the correlation between child anxiety symptoms and interpretation bias was not significant and was comparable to that found here; $r = -.03$, $p = .83$, and $r = .13$, $p = .13$, respectively. It is plausible that this discrepancy in findings between clinical anxiety diagnoses and anxiety symptoms occurs because the link between interpretation bias and anxiety is a feature of clinical anxiety but does not vary with non-clinical individual differences in anxiety scores. As the present study adopted a community sample, the lack of variation in participants' anxiety scores may have limited the scope for detecting a significant effect. Nevertheless, given the comparable correlations with Dodd and colleagues, as mentioned above, this does not provide a complete explanation. One point that is an important consideration for the present research is that we don't yet know how stable any association between interpretation bias and anxiety is in young children or, indeed, how stable bias as assessed using the story-stem task is. Field and Lester (2010) proposed that biases in information processing may not be present or fully developed in young children until certain cognitive, emotional and social skills necessary to sustain these biases have developed. In line with this, it is plausible that cognitive biases initially develop during the preschool years but that the association with anxiety isn't stable until later in childhood. For instance, during early childhood, children's capacity to anticipate negative outcomes (Muris, Merckelbach, Meesters, & van den Brand, 2002) and to adequately recognize that a problem may have multiple possible outcomes in the context of ambiguity (Horobin & Acredolo, 1989) develops significantly and these factors may affect the emergence of an anxiety-linked interpretation bias. It is also plausible that the inconsistency with previous findings with older children could be due to the fact that symptoms here were

reported by parents using a questionnaire measure; the most convincing associations between anxiety and bias in older children are found when children self-report their anxiety as compared to when parents report on their child's anxiety using a questionnaire measure (e.g. Creswell et al., 2011).

The second aim of the present research was to examine whether parents and their preschool-aged children share similar levels of threat interpretation. Contrary to the second hypothesis, young children's interpretation bias was not significantly correlated with their parent's interpretation bias. Although this is not in keeping with the intergenerational transmission hypothesis, it is consistent with some previous research that has also failed to find this association (Creswell et al., 2006; 2011; Gifford et al., 2008). The lack of association between parent and child interpretation bias could be influenced by the use of different points of view: parents' responses to the scenarios were based on themselves, while children completed the story-stems based on the dolls (i.e., Bob or Jane). Additionally, interpretation bias in parents and children were measured using different response methods. To ensure that the task was developmentally appropriate, children completed the story-stems verbally, while parents completed a pencil and paper measure. Moreover, in efforts to incorporate developmentally-relevant themes, children's story-stems were physical (50%), social (25%), and separation (25%) in nature, while parents' interpretation task mainly measured general (50%) and social (50%) anxiety. To enable greater comparability across informants, future research should ask children to respond to the story-stems based on their own perspective, as well as develop parallel versions of the interpretation bias task for parents and their young children, as least in terms of its content. Further research, ideally using longitudinal methods, could provide clearer insight into the association between parents' and their children's interpretation biases over time and might help to tease apart the potential effect of cognitive maturation on the development of maladaptive cognition in young children.

The third aim was to examine whether parent trait anxiety was associated with the number of written stories they ended in a threatening way when asked how they would tell their child the stories. Results were not consistent with the third hypothesis; there was no evidence for a significant relationship between parental trait anxiety and their written stories. It is possible that parents from a community sample may be more wary about communicating threat to their children, and may be deliberately selective about ending stories in a non-threatening manner, regardless of their trait anxiety. However, previous research involving community samples suggests that parents who were more anxious indeed told more threatening stories to their older children (Field et al., 2008; Muris et al., 2010). Future research could investigate whether this inhibitory effect may be particularly prominent in parents with young children, possibly due to greater perceived vulnerability in younger children.

As existing research on the effect of parental verbal information on children's interpretation bias predominantly focuses on children aged 7 years and older (Barrett et al., 1996; Chorpita et al., 1996; Dadds et al., 1996; Muris et al., 2010), the final aim of the present study was to investigate whether young children's interpretation bias was linked to their parents' written stories. The results supported the hypothesis, indicating that children's interpretation bias was associated with the amount of threat in parents' written stories. Consistent with previous research, these findings support the idea that parental verbal information might affect preschool children's biases. Although there was no evidence for an association between parents' story-telling and children's anxiety symptoms, it is important to consider that Dodd et al. (2012) found that children's interpretation bias predicted child anxiety 12-months later. Thus, parent stories may affect children's interpretation of ambiguity, which may in turn affect their vulnerability for anxiety over time.

Exploratory analyses regarding the possible moderating effects of children's age and gender indicated that parents' written stories were associated with interpretation bias in younger children (2-3 years) but not older children (4-5 years), and that, in younger children, the association was stronger for girls than for boys. There was a very strong significant correlation between parents' written stories and interpretation bias in girls aged 2-3 years, while the correlation for boys of a similar age was large, this did not reach statistical significance given the small sample. This may indicate that younger children are particularly receptive towards parents' verbal information, with girls being more affected than boys. Alternatively, as most of the parent participants were mothers, the association may be stronger when the parent is of the same sex; there were not enough fathers in the present sample to explore this question specifically. It is important to note that these findings are very preliminary as this analysis was exploratory and the study was not powered to address these questions. However, they do indicate that there may be some important age and gender effects that could be further explored in future research.

As the present research is cross-sectional, we are unable to draw conclusions about direction of the effects. It remains possible that parents anticipate how their child would tell the story and complete the written story-stem measure with that in mind. To examine causal pathways convincingly, future research could explore the use of the Story-stem Paradigm as an intervention, focused on training parents to tell their young children stories in a particular way. If children's interpretation bias decreases after parents tell them non-threatening stories, this would provide convincing evidence that parent verbal information can affect children's bias. Ultimately, this could be useful as a preventative intervention, nicely extending recent research (Lau, Pettit & Creswell, 2013), which demonstrated potential clinical implications for the use of positive parental verbal information in reducing children's (aged 7-11 years) threat interpretation and social anxiety symptoms through story telling.

The main strength of the present study was its focus on preschool-aged children in exploring the intergenerational transmission of interpretation bias, as previous research has almost exclusively focused on older children. The preschool years may be crucial for exploring the developmental origins of interpretation bias. The present study is the first to extend the Story-stem Paradigm beyond the three ambiguous stories piloted by Dodd et al. (2012) and to trial the paradigm in an unselected sample.

The research has some limitations, and the results should be interpreted with these in mind. As is the case with other similar research, fathers were underrepresented in this sample. Parental factors (parent interpretation bias and written stories) were predominantly reported by mothers (90%) even though it is likely that both parents play a role in influencing their child's cognitive biases, necessitating greater inclusion of fathers in future research. Furthermore, it is likely that a number of factors affect children's interpretation bias and the association between parent cognitions and children's bias, including ethnicity, socio-economic status, as well as shared negative experience. The present research was not designed to address these questions and a much larger sample would be required. Nevertheless, this remains an area of interest for future research.

Furthermore, the present study adopted a written story-stem measure instead of requiring parents to tell the stories directly to their children. This variable was measured using a paper and pencil format to maximise the reliability of coding, minimize the child's participation time, and avoid issues relating to the bi-directionality of effects between parents and their children whilst conducting the research. It is worth noting that an initial pilot task was carried out in which parents told their children the stories directly, after the children had completed their own story-stems. It was found that the children could not attend to the task for long enough to complete both phases in a single session, so the procedure was adapted to written stories. The drawback of this method is that it is possible the way parents say they would tell their children the stories may not be representative of

how they would actually tell the stories. It is also possible that the written stories may tap into other closely related domains of parental cognitions, such as parents' extension of their interpretation bias to situations involving their children (e.g. Lester, Field, & Cartwright-Hatton, 2012; Lester, Field, Oliver, & Cartwright-Hatton, 2009) and/or parents' expectation of their children's responses to the ambiguous situations (e.g. Creswell et al., 2011), which have been found to be associated with parents' anxiety and children's interpretation bias and/or anxiety symptoms, respectively. Future studies could clarify some of these possibilities by including a condition requiring parents to tell the stories to a young child who they are not acquainted with, as well as asking children to complete the story-stems based on themselves. Moreover, the ecological validity of the Story-Stem Paradigm is somewhat unclear. It was not possible to ascertain whether young children's responses were indeed real-world interpretations of the ambiguous scenarios, or whether they engaged in pretend-play that may not necessarily be entirely congruous with the cognitive and affective responses of an interpretation when confronted with a real-life situation. This is, however, a criticism applicable to nearly all measures of interpretation bias, even in older children and adults.

Finally, caution should be maintained when interpreting the results due to the following issues. The relatively small sample size may have undermined the chance of detecting possible effects due to a lack of statistical power in the present study. A sample of 50 participants provides 98% power to detect a large effect size, but results suggest that the size of the relationships of interest is modest at best. For instance, in terms of the relationship between parents' and their children's interpretation bias, post-hoc power analyses using G*Power revealed that based on the effect size and error probability observed ($r = .25$, $p = .12$) and a sample size of 38, the statistical power achieved was .65. A sample size of approximately 95 pairs of participants would be needed to obtain the statistical power of .80 and a two-tailed statistical significance level of .05. Additionally,

future research of a similar nature involving young children should account for the rate of missing data when estimating the appropriate sample size. For the present research, the rate of missing data for young children's interpretation bias was 24%, reducing the total sample size to 38 children with usable data for this variable. This was comparable to Dodd et al.'s (2012) research that had a 30% missing data rate for the same variable and future research of a similar nature will need to account for the rate of missing data when estimating the appropriate sample size. In addition, the sample may not be entirely representative as the analyses showed moderate effect sizes for group differences in anxiety symptoms and interpretation bias between children with complete total interpretation bias scores and those with missing data, suggesting that children included in the analyses may be more anxious, but have lower threat interpretations, compared to children with missing data. This could be due to greater compliance during the Story-stem Paradigm by children who were more anxious.

The findings of the present research indicate that how parents report they will tell stories to their children is associated with their threat cognitions that have been linked with children's risk for anxiety over time (Dodd et al., 2012). These findings suggest that early interventions might be able to use parental verbal information as a means of changing maladaptive cognitions in at-risk or anxious young children. Accordingly, future efforts could pilot the use of the Story Stem Paradigm as a tool through which positive parental verbal information could be transferred via storytelling and doll-play to young children.

Chapter 3

Study 2: The Effects of Peer Discussion: Do Close Friends Influence Each Other's Fearfulness?

Abstract

In exploring the origins of fears and phobias, the present study investigated whether close friends affect each other's fears when they discuss fear-related issues together. Two hundred and forty two primary school-aged children (aged between 7 to 10 years) were first presented with ambiguous and threatening information about novel animals, after which their fear responses towards each animal were measured independently. Next, pairs of close friends had a discussion about fear-related issues related to the animals and subsequently their fear responses were measured again independently. Results indicated that close friends shared similar fear responses even before the discussion, and these became more similar following the discussion. Gender pair type predicted change in children's fear responses over time; only children in boy-boy pairs showed a significant increase in fear responses following the discussion. Differences in anxiety level between close friends did not affect change in fear responses during the discussion. Although there is some indication that children may affect each other's fears, it is likely that other sources of influence, such as parents, may still play a larger role in affecting children's fears compared to close friends at this age.

Introduction

Fears are highly prevalent in childhood, and are usually mild and benign (Gullone, 2000). According to Lang's (1968, 1985) tripartite model, fear is characterized by verbal-cognitive responses (e.g. subjective feelings of apprehension), behavioural changes (e.g. avoidance), and physiological arousal (e.g. sweating, trembling, heart palpitations). Normative fears include fear of ghosts and the supernatural in early childhood (Bauer, 1976), fear of animals in middle childhood, and fear of self-injury as well as socio-evaluative apprehension in late childhood and adolescence (Muris & Field, 2010). Although these fears usually diminish over time, a substantial minority of children goes on to develop significant fears that interfere with their daily functioning. Specific phobias are the most common form of childhood anxiety disorder (Costello, Egger, Copeland, Erkanli, & Angold, 2011). If left untreated, phobias can continue into adulthood. Retrospective interviews with phobic adults indicate that certain fears, such as animal phobias, first developed when the individuals were aged as young as 7 years old (Öst, 1987).

In exploring the origins of fears and phobias, research in behavioural genetics suggests that up to half of the variance in childhood fears can be explained by a child's genetic inheritance, depending on the type of fear (Eley & Gregory, 2004). This leaves a substantial role for environmental factors, such as discrete learning experiences. Rachman (1977) posited that the transmission of verbal threat information is one of the pathways through which children learn fears and phobias. In keeping with this hypothesis, a substantial body of research has demonstrated that children generally become less fearful of stimuli when presented with positive information about the stimulus and more fearful when presented with threatening information (Muris & Field, 2010). For instance, Field et al., (2001) presented either threatening or positive information about a novel monster doll to children aged 7-9 years, and measured their fear beliefs about the doll before and after being given the information. Results showed that children's fear beliefs towards the monster

doll increased following threatening information and decreased when given positive information. More recent research suggests that ambiguous information also heightens children's fears, although the observed effect is weaker relative to threatening information (Dalrymple-Alford & Salmon, 2013; Field & Field, 2013; Muris, Rassin, et al., 2009). Similar to the study described above, Dalrymple-Alford & Salmon (2013) showed that children aged 7-10 years became significantly more fearful towards a novel animal following the presentation of ambiguous information. Overall, there is considerable evidence showing that children's fears are affected by the information they are given from others. Children may receive this information from a variety of sources, including parents and peers (Muris & Field, 2010).

Research examining the intergenerational transmission of anxiety has provided some indication that parents may inadvertently transmit anxiety-related cognitions to their children (Drake & Ginsburg, 2012; Hadwin et al., 2006). There is evidence that children share similar levels of interpretation bias (a tendency to interpret ambiguity negatively) with their parents (Bögels et al., 2003; Creswell & O'Connor, 2006; Creswell et al., 2005; Creswell, Shildrick, et al., 2011), although other studies have failed to find this association (Creswell et al., 2006; Gifford et al., 2008). Verbal information transfer is one of the plausible pathways through which this intergenerational transmission of anxious cognitions occurs (Field & Lester, 2010; Hadwin et al., 2006; Muris & Field, 2010; Ooi, Dodd, & Walsh, 2015). For example, Ooi, Dodd and Walsh (2015) found that preschool-aged children with higher levels of interpretation bias had parents who reported telling a greater number of threatening stories to them. Further indication that parents can affect children's anxiety-related cognitions comes from early research demonstrating that parents enhance their children's interpretation bias and/or avoidant responses following family discussions (Barrett et al., 1996; Chorpita & Albano, 1996; Dadds, Barrett, Rapee, & Ryan, 1996). For instance, Barrett et al., (1996) and Dadds et al. (1996) found that clinically anxious children became more

avoidant following family discussion of ambiguous scenarios, with their parents exhibiting a tendency to agree with their avoidant plans. In contrast, non-anxious children became more prosocial following the discussion with their parents exhibiting a tendency to listen to and agree with their prosocial plans.

In line with the above, it is plausible that the transmission of fears, as well as ideas about how to behave in fear-provoking situations, might also occur in other forms of close relationships. As children transition from early to middle childhood, peers become increasingly influential as a supplementary source of information about the environment alongside parents (Schunk, 1987; Schunk & Hanson, 1985). Therefore, it is possible that children in close friendships might affect each other's fears. Thus far, however, there has been relatively little research in this area. To our knowledge, only Muris and Rijkee (2011) have explored whether children's fears are influenced by their interactions with other children of the same age, although the children were deliberately paired with a non-close peer for the purpose of this study. To examine this, half of the children (aged 9-12 years) were first exposed to positive information about a novel animal, after which their fear beliefs towards the animal were measured. Subsequently, the children were exposed to ambiguous information about another novel animal, followed by a discussion about fear-related issues with a same-gender peer before their fear beliefs towards the animal were measured. The same procedure was adopted for the other half of the children in the study, but they were first exposed to ambiguous information in the individual (non-discussion) condition, followed by the presentation of positive information in the peer-discussion condition. Results showed that when presented with positive information, all children who had a peer discussion were less fearful towards the animal, compared to those in the individual condition. However, when presented with ambiguous information, boys, but not girls, who had a discussion with a peer had lower fear beliefs than those who did not have the discussion; there was no significant difference between the fear beliefs of girls in either the

discussion or non-discussion conditions. As a whole, the findings indicate that discussion with a non-close peer might lead to an attenuation of fear beliefs but only in boys. Muris and Rijkee posited that this could be influenced by children's gender-role orientation, with boys downplaying their level of fearfulness when discussing their fears with other boys they are not close to, while the expression of fear may be more accepted among girls.

To extend current understanding about how peers might affect each other's fears during childhood, there are a number of areas to be explored. First, as close friends tend to interact more regularly with each other than non-close peers, children in close friendships may play an influential role in affecting and/or maintaining each other's fears. To understand the origins of children's fears and to potentially reduce these fears, it is more ecologically valid to examine the interaction between close friends than non-close peers. Second, it is not clear how close friends affect each other's fear beliefs when they are given threatening information (note that Muris and Rijkee only gave ambiguous and positive information) and enter a discussion situation with relatively high fear beliefs. It is possible that the same attenuating effect will be found or that children may enhance each other's fears in the context of threatening information.

A further consideration is the potential effect of individual differences in the transmission of fears within close friendships. In everyday life, children tend to encounter ambiguous situations more frequently than explicitly threatening ones, and some children may be particularly vulnerable to developing fears in these situations. For instance, research suggests that trait anxious children are likely to interpret ambiguous information as more threatening than non-trait anxious children (e.g. Creswell et al., 2005; Hadwin et al., 1997). In the context of peer interaction, it is plausible that the trait anxiety level of the two individuals involved in the discussion may determine the effect of the discussion on their fear beliefs. When children discuss ambiguous information with a less anxious friend, they may adjust their beliefs and become less fearful, persuade their friend to become more

fearful or remain unaffected by the discussion. This has yet to be explored in relation to anxiety but research examining aggression found that adolescents who communicated with online peers (e-confederates) who endorsed hostile intent to others reported increased hostile attributions themselves following the interaction, while those exposed to the benign intent condition reported reduced hostility (Freeman, Hadwin, & Halligan, 2011).

The present research aimed to significantly extend the existing literature regarding peer discussion of fear by exploring how close friends affect each other's fear responses when they discuss fear-related issues together. Besides children's fear beliefs, the present study also explored whether their avoidance behaviours were affected by the discussion. Children were first presented with ambiguous and threatening information about novel animals, after which their fear beliefs and behavioural avoidance (together referred to as fear responses) for each animal was measured (T1). Subsequently, pairs of close friends discussed their fear beliefs and avoidance before completing the measures again independently (T2). The hypotheses evaluated for the present research were as follows. Replicating the findings of previous verbal information transfer research, it was hypothesised that, (H1) children will exhibit significantly higher fear responses towards the animal described as threatening, compared to the animal described as ambiguous. It was further hypothesized that close friends will share similar patterns of fear responses at baseline, therefore (H2) the fear responses of close friends will be significantly correlated at T1. Additionally, it was hypothesized that close friends' fear responses will become more similar after the discussion, thus (H3) the correlation between the fear responses of close friends will be significantly stronger at T2 than at T1. Additionally, we were interested to examine whether the effect of the peer discussion varied across gender pairs (boy-boy, girl-girl, boy-girl). Based on the findings of Muris and Rijke (2011), we hypothesised that, when presented with ambiguous information, (H4) only children in boy-boy pairs will show a significant decrease in fear responses following peer discussion, with other gender pairs

showing no significant change. There is no previous research from which to base a hypothesis regarding how the effect of the discussion may vary across gender pairs following the presentation of threatening information so this analysis was exploratory. Lastly, we were also interested to explore whether the effects of peer discussion were moderated by differences in anxiety levels between close friends. Again, this analysis was exploratory as there is no previous research to base a hypothesis on.

Method

Participants

Two hundred and forty two children (106 boys, 136 girls) aged between 7 and 10 years ($M = 9.24$, $SD = .94$) were recruited from a primary school in Norfolk, UK. Class teachers put children into pairs based on those who were close friends with each other. This resulted in 40 pairs of boys, 55 pairs of girls, and 26 boy-girl pairs. Note that in order to capture genuine close friendships, we didn't restrict friendship pairs to same sex pairs. Children were invited to take part in the study initially via a letter sent home to parents explaining the details of the research. Parents who did not want their children to take part notified the school directly. All children in Years 3, 4 and 5 ($n = 288$) were invited to participate and the parents of seven children withdrew them from the study. The remaining 281 children were invited to take part during school time. Their class teacher explained the research to them and they were informed that they did not have to take part if they did not want to. A further 39 children did not complete the research for the following reasons: absent from school ($n = 26$), did not consent ($n = 1$), teacher decided it was not appropriate for child to participate due to language or behavioural problems ($n = 12$). The majority of participants were white British (69.8%), and 31.8% of them were eligible for and claiming free school meals, compared to 18.3% of primary school pupils in England (Department for Education, 2013).

Measures

Anxiety symptoms. Children completed the Spence Children's Anxiety Scale (SCAS; Spence, 1998), which is a 45-item (38 anxiety-related items and 7 filler items) self-report measure assessing the severity of anxiety symptoms in children, in accordance with anxiety disorder dimensions as defined by the DSM-IV. The SCAS has been used with children aged 8-12 years (Spence, 1998) and has strong internal consistency and good test-retest reliability (Spence, 1997). Cronbach's α in this sample was .91.

Fear beliefs. Children completed the Fear Beliefs Questionnaire, (FBQ; Field et al., 2001) as used by Muris and Rijkee (2011) (Refer to Appendix 5), which is a 10-item measure assessing their fear beliefs about each novel animal. The FBQ has been used with children aged 6-9 years (Field & Lawson, 2003) and 9-12 years (Muris & Rijkee, 2011), and has moderate to good internal consistency (Field, 2006). Cronbach's α in this sample were between .91 and .94.

Pictures and Stories. Pictures of two Australian marsupials (the Cuscus and the Quoll) were used to introduce the animals to the children. As children in Britain are unfamiliar with these marsupials, it is likely that they do not possess any prior knowledge about these novel animals. The children were read two versions of information about the animals – ambiguous and threatening (Muris, Rassin, et al., 2009) (Refer to Appendix 6), which were presented counterbalanced with the animal type.

Behavioural avoidance task. The Nature Reserve Map (NRM) (refer to Appendix 7) was designed to provide a behavioural measure of children's fears towards novel animals. This map is an adaptation of Field and Storksen-Coulson's (2007) 3D model of the Nature Reserve Task, which enables the measurement of avoidance behaviours in a questionnaire format (A4-sized). The map shows an enclosure with fences on the top and bottom edges. A straight horizontal path is positioned in the middle, with bushes and flowers evenly distributed on both sides. The Cuscus or Quoll is situated in a bush at one end of the path,

while the other end is an opening to the enclosure. There is a Nature Reserve Map for each animal (The Cuscus Nature Reserve Map and The Quoll Nature Reserve Map), with the opening to the enclosure counterbalanced to appear on either the left- or right-end of the page. The children were told that the Nature Reserve Map shows where the animal lives, and were asked to draw a cross on the path to indicate where they would like to be in the nature reserve. Avoidance behaviour was measured as the distance (cm) from the indicated cross to the animal.

Procedure

The School of Psychology Research Ethics Committee at the University of East Anglia approved the methods of the study. The research was conducted in school, one class at a time. At baseline (T1), the children first completed measures of anxiety symptoms. Their class teacher then read out ambiguous information about animal A, after which they completed the FBQ and NRM for animal A. Next, the children were presented with threatening information about animal B, followed by the completion of the corresponding FBQ and NRM. The children were instructed to complete the measures on their own, without discussing their answers with each other. Questionnaire packs were counterbalanced by class; the assignment of animal (Cuscus vs. Quoll) to the type of information (ambiguous vs. threatening), and the position of the opening of the enclosure on the map (left vs. right) were counterbalanced. In efforts to minimize any potential carry-over effects, ambiguous information about an animal was always presented first, followed by threatening information about the other animal.

The discussion and post-test (T2) were conducted after a 15-minute break. At this time, class teachers paired the children based on their close friendships with each other – determined by the friend they chose as a partner on school outings. The children were taken out of class one pair at a time. Each pair was seen in a separate room by either the first author or one of two female research assistants, trained by the first author. The discussion

session was video-recorded and the experimenter was present throughout the session to ensure that the children were on task. The experimenter first reminded the children about Animal A and presented the ambiguous information to them again, after which they were instructed to explicitly discuss with each other their answers for the FBQ and Nature Reserve Map, without referring to their answers for the questionnaires they previously completed at T1. The children were then separated and asked to complete both the measures again on their own. The same procedure was then repeated for Animal B, with the presentation of threatening information, followed by the discussion and completion of the measures. After all the pairs had taken part in the discussion and completed their measures for a second time, the children were debriefed as a class. During debrief, they were then presented with real information about the Cuscus and the Quoll, shown a short video of each animal, and a plush toy version of each animal was passed around the class for the children to stroke. Finally, the children were thanked for their participation and given a small gift. Figure 1 provides a schematic overview of the procedure of the present study.

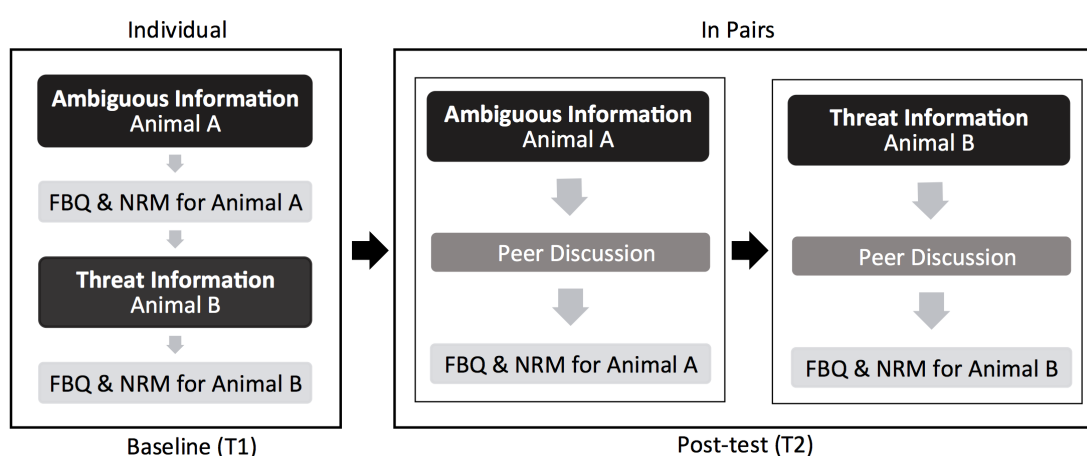


Figure 1. Overview of the procedure of the present study. Note. FBQ fear beliefs questionnaire, NRM nature reserve map.

Results

Data Preparation

All the variables described above were not normally distributed, except for children's ambiguous FBQ at T1 and T2. There was a slight positive skew in the distribution of responses for children's anxiety symptoms, and normality was observed when a square root transformation was computed for the SCAS variable. For the remaining variables that were not normally distributed, transformations did not amend the normality of the distribution of responses. Therefore, all analyses involving these variables were bootstrapped when possible, and estimates using 1000 bootstrapped samples are reported. To examine whether the difference in anxiety symptoms between close friends moderated the effect of the discussion, an anxiety difference variable was computed by subtracting a friend's anxiety score from an individual's own, thus positive scores indicate participants who are more anxious than their friend and negative scores indicate participants who are less anxious than their friends.

Analyses

Preliminary Analyses.

Preliminary analyses indicated no significant effects of animal type (Cuscus vs. Quoll) on children's fear beliefs and avoidance at both T1 and T2 for ambiguous information ($p > .15$) or threat information ($p > .10$). Similarly, there were no significant effects of the position of the NRM enclosure opening (left vs. right) on children's behavioural avoidance ratings at both T1 and T2 for threat information ($p > .50$). For ambiguous information, children indicated significantly greater avoidance of the animals when the enclosure opening was on the right of the NRM, compared to when it was on the left at both T1 and T2, $t(227.62) = 4.03, p < .001, d = .26$; $t(224.17) = 4.80, p < .001, d = .31$. Two sets of analyses involving both these variables were conducted, first involving the group of children exposed to the left NRM opening, followed by the other group exposed to the right opening. Findings

from both sets of analyses were comparable, so the effect of the enclosure opening position on ambiguous information is not controlled for in the analyses reported.

There were significant positive correlations between anxiety symptoms and fear responses (fear beliefs and avoidance behaviours) when ambiguous and threatening information was presented to the children at T1 and T2, $r_s = .13 - .54$, $p_s < .05$. Girls ($M = 43.62$, $SD = 19.82$) reported significantly higher anxiety symptoms than boys ($M = 29.85$, $SD = 18.10$), $t(239) = 2.55$, $p = .01$, $d = .33$. There was no significant relationship between children's age and their anxiety symptoms, $r = -.03$, $p = .67$. Additionally, girls reported significantly higher fear beliefs and avoidance behaviours than boys when ambiguous and threatening information was presented to them at T1, $p_s < .002$. At T2, there was no significant gender differences in children's reported fear beliefs when they were presented with both information types, $p_s > .22$. However, girls reported significantly greater avoidance than boys when ambiguous and threatening information was presented to them at T2, $p_s < .04$. Moreover, although children's age was not significantly correlated with their fear beliefs across information types at T1, $r_s = -.03$ to $-.11$, $p_s > .08$, there was a significant negative correlation between age and behavioural avoidance across information types, $r_s = -.13$ to $-.21$, $p_s < .04$. At T2, although age was not significantly correlated with fear beliefs across information types, or with behavioural avoidance when ambiguous information was presented to them, $r_s = -.07$ to $.06$, $p_s > .05$, there was a significant negative correlation between age and behavioural avoidance when threatening information was presented to them, $r = -.16$, $p = .02$. Table 1 shows the descriptive statistics for key variables in the present study.

Verbal Information Transfer (Manipulation Check)

Table 1

Descriptive Statistics for Verbal Information Transfer

	Mean (Standard Deviation)					
	Entire Sample		Boys		Girls	
FBQ Ambiguous T1	26.91	(10.26)	23.74	(9.73)	29.37	(10.02)
FBQ Threat T1	42.55	(9.96)	40.21	(11.63)	44.38	(8.02)
NRM Ambiguous T1	6.34	(5.66)	4.83	(5.05)	7.51	(5.85)
NRM Threat T1	12.87	(5.53)	11.32	(6.41)	14.07	(4.40)

Table 1 shows the descriptive statistics for children's fear beliefs and behavioural avoidance at T1 when ambiguous and threatening information were presented to them. To explore the effects of verbal information on children's fear beliefs and behavioural avoidance, two 2 (Information Type: Ambiguous or Threatening) x 2 (Gender) mixed ANCOVA analyses were conducted, with information type as the repeated measures variable, as well as anxiety symptoms and age as covariates. The effects of anxiety symptoms, gender and age were controlled for in the analyses above because preliminary analyses showed that these variables were related to fear beliefs and/or behavioural avoidance at T1. The results are presented in Table 2 below.

Table 2

The Effects of Verbal Information on Children's Fear Responses

	Main/ Interaction Effects	<i>F</i>	<i>df</i>	<i>partial η²</i>
Fear Beliefs	Info Type	19.92 **	(1, 236)	.08
	Gender	5.48 *	(1, 236)	.02
	Anxiety	60.20 **	(1, 236)	.2
	Age	1.90	(1, 236)	.01
	Info Type x Anxiety	14.11 **	(1, 236)	.06
	Info Type x Age	1.45	(1, 236)	.01
	Info Type x Gender	.12	(1, 236)	<.001
Behavioural Avoidance	Info Type	.93	(1, 236)	<.004
	Gender	9.40 **	(1, 236)	.04
	Anxiety	24.42 **	(1, 236)	.09
	Age	12.20 **	(1, 236)	.05
	Info Type x Anxiety	2.37	(1, 236)	.01
	Info Type x Age	1.35	(1, 236)	.01
	Info Type x Gender	.49	(1, 236)	<.005

* Are significant at $p < .05$. ** Are significant at $p < .01$.

It was hypothesized that children would exhibit significantly higher fear responses towards the animal described as threatening, compared to the animal described as ambiguous (H1). Consistent with this hypothesis, for fear beliefs, results showed a significant main effect of information type. In addition, there was a significant main effect of gender, with girls having significantly higher fear beliefs than boys. Children's anxiety symptoms interacted with information type: anxiety symptoms was significantly correlated with fear beliefs following the ambiguous and threatening information respectively, $r = .55$, $p < .001$ and $r = .29$, $p < .001$ but had a greater effect on children's fear beliefs towards the animal described as ambiguous, $t(236) = 8.89$, $p < .001$, $B = 3.07$, $\text{partial } \eta^2 = .25$, compared to when the animal was described as threatening, $t(236) = 3.68$, $p < .001$, $B = 1.40$, $\text{partial } \eta^2 = .05$.

There was no evidence for a main effect of information type for behavioural avoidance, although there was a main effect of gender, with girls reporting greater behavioural avoidance than boys. There were significant main effects of anxiety symptoms and age on behavioural avoidance.

Effects of Peer Discussion.

It was further hypothesized that close friends will share similar patterns of fear responses at baseline, therefore (H2) the correlation between the fear responses of close friends will be significantly correlated at T1. Additionally, it was hypothesized that close friends' fear responses will become more similar after the discussion, thus (H3) the correlation between the fear responses of close friends will be significantly stronger at T2 than at T1.

To examine whether close friends share similar patterns of fear responses at baseline (H2), and whether their fear responses become more similar after the discussion (H3), bootstrapped bivariate correlations were first conducted to explore the relationship between fear responses in close friendship pairs at baseline (T1) and at post-test (T2). Next, Z Statistics were used to compare the correlations between children's fear responses at baseline and at post-test. Table 3 shows that close friends' fear beliefs, as well as their behavioural avoidance at T1 were significantly correlated, indicating that close friends do share similar patterns of fear responses towards both the animals described as ambiguous and threatening at baseline. Moreover, the relationship between close friends' fear beliefs and avoidance behaviours became significantly stronger from T1 to T2, suggesting that children's fear responses towards both the animals described as ambiguous and threatening became more similar following the discussion.

It is plausible that the shared patterns of fear responses observed at T1 were driven by group effects, rather than close friendship pairs. More specifically, as preliminary analyses indicated that girls reported higher fear beliefs and avoidance than boys at T1, it is conceivable that the higher scores in girls and lower scores in boys generally drove the correlations in fear responses, particularly in same-gendered pairs. To check that this was not the case, a bivariate correlation was conducted to examine the relationship between close friends' anxiety scores. Results showed a significant moderate correlation in close

friends' anxiety symptoms, $r = .30$, $p < .005$, therefore it is likely that the shared patterns of fear responses between close friends at T1 indeed reflects shared anxiety-related cognitions between close friendship pairs.

Table 3

Bootstrapped Pearson's Correlations for the Fear Responses Between Close Friends, and the Z-Statistics Comparing Correlations from T1 to T2

		Ambiguous Fear Beliefs		Threatening Fear Beliefs		Ambiguous Avoidance		Threatening Avoidance		T1 vs. T2 Z-Statistics
		T1	T2	T1	T2	T1	T2	T1	T2	
Ambiguous Fear Beliefs	T1	.28**								z = 2.70 **
	T2		.53**							
Threatening Fear Beliefs	T1			.33**						z = 3.12 **
	T2				.57**					
Ambiguous Avoidance	T1					.33**				z = 2.04 *
	T2						.48**			
Threatening Avoidance	T1							.23*		z = 2.20 *
	T2							.46**		

* Are significant at $p < .05$. ** Are significant at $p < .01$.

Table 4 shows the descriptive statistics for children's fear responses towards novel animals at both T1 and T2 when ambiguous and threatening information were presented to them.

Table 4

Descriptive Statistics for the Effects of Peer Discussion

	Mean (Standard Deviation)							
	Entire Sample		Gender Pairs					
			Boy-Boy		Boy-Girl		Girl-Girl	
Trait Anxiety (SCAS)	36.80	(19.78)	30.47	(18.77)	35.24	(18.91)	42.31	(19.58)
FBQ Ambiguous T1	26.69	(10.17)	23.78	(9.76)	26.43	(10.11)	28.98	(10.02)
FBQ Ambiguous T2	27.88	(10.86)	27.49	(10.93)	26.66	(11.17)	28.80	(10.69)
FBQ Threat T1	42.63	(9.76)	41.24	(10.03)	42.90	(11.26)	43.53	(8.67)
FBQ Threat T2	42.25	(8.82)	42.63	(8.71)	42.48	(9.95)	41.86	(8.36)
NRM Ambiguous T1	6.17	(5.56)	4.84	(4.94)	6.45	(5.96)	7.03	(5.66)
NRM Ambiguous T2	6.62	(5.64)	5.05	(4.34)	7.46	(6.87)	7.37	(5.63)
NRM Threat T1	12.80	(5.56)	11.36	(6.19)	13.39	(5.66)	13.57	(4.81)
NRM Threat T2	13.94	(4.44)	13.49	(4.94)	13.68	(4.97)	14.42	(3.71)

To explore whether gender pair type (H4) and the difference between close friends' anxiety levels affect change in children's fear beliefs and behavioural avoidance from T1 to T2, a 2 (Time: T1 or T2) x 3 (Gender Pairs: boy-boy, boy-girl or girl-girl) mixed ANCOVA analysis was conducted, with the difference in anxiety scores between close friends as a covariate. This analysis was conducted for threatening information and ambiguous information separately, first with fear beliefs as the dependent variable and then with behavioural avoidance as the dependent variable, resulting in a total of 4 analyses. The results of these analyses are presented in Table 5 below. Planned additional comparisons were conducted to examine change in fear beliefs and avoidance behaviours from T1 to T2 for each gender pair type (i.e., boy-boy, boy-girl, girl-girl) using repeated measures ANCOVA analyses with time as the repeated measures variable and the difference in anxiety scores between close friends as a covariate. Table 6 shows the results of the planned comparisons, after Bonferroni corrections were applied (significant at $p < .0167$).

Table 5

Analyses for the Effects of Peer Discussion

	Main/ Interaction Effects	<i>F</i>	<i>df</i>	<i>partial η</i> ²
Ambiguous				
Fear Beliefs	Time	3.47 ‡	(1, 231)	.02
	Gender Pairs	3.47 *	(2, 231)	.03
	Anxiety Difference	10.13 **	(1, 231)	.04
	Time x Anxiety Difference	2.14	(1, 231)	.01
	Time x Gender Pairs	4.53 *	(2, 231)	.04
Ambiguous				
Avoidance	Time	1.70	(1, 228)	.01
	Gender Pairs	4.63 *	(2, 228)	.04
	Anxiety Difference	6.71 *	(1, 228)	.03
	Time x Anxiety Difference	2.53	(1, 228)	.01
	Time x Gender Pairs	.68	(2, 228)	.01
Threatening				
Fear Beliefs	Time	.04	(1, 232)	<.001
	Gender Pairs	.85	(2, 232)	.01
	Anxiety Difference	2.84	(1, 232)	.01
	Time x Anxiety Difference	.37	(1, 232)	<.005
	Time x Gender Pairs	4.86 *	(2, 232)	.04
Threatening				
Avoidance	Time	9.52 **	(1, 230)	.04
	Gender Pairs	3.43 *	(2, 230)	.03
	Anxiety Difference	1.60	(1, 230)	.01
	Time x Anxiety Difference	3.89 ‡	(1, 230)	.02
	Time x Gender Pairs	2.02	(2, 230)	.02

*Are significant at $p < .05$. ** Are significant at $p < .01$. ‡ Are close to significant ($p < .066$).

Table 6

Planned Comparisons for the Interaction between Time and Gender Pairs, results show the effect of time for each gender pair separately, by condition.

	Pairs	Mean (SE)		F	df	partial η^2
		T1	T2			
Ambiguous Fear Beliefs	Boy-Boy	23.61 (1.10)	27.35 (1.24)	12.75 *	(1, 76)	.14
	Boy-Girl	26.43 (1.24)	26.66 (1.47)	.03	(1, 50)	<.005
	Girl-Girl	29.12 (.98)	28.75 (1.03)	.17	(1, 103)	<.005
Ambiguous Avoidance	Boy-Boy	4.99 (.56)	4.98 (.50)	<.005	(1, 74)	<.001
	Boy-Girl	6.45 (.77)	7.46 (.94)	2.48	(1, 50)	.05
	Girl-Girl	6.96 (.55)	7.31 (.55)	.47	(1, 102)	.01
Threatening Fear Beliefs	Boy-Boy	40.41 (1.23)	42.20 (1.02)	4.00	(1, 76)	.05
	Boy-Girl	42.90 (1.51)	42.48 (1.37)	.37	(1, 50)	.01
	Girl-Girl	43.76 (.84)	42.09 (.81)	4.60	(1, 104)	.04
Threatening Avoidance	Boy-Boy	11.41 (.70)	13.31 (.59)	9.71 *	(1, 75)	.12
	Boy-Girl	13.39 (.76)	13.68 (.69)	.28	(1, 50)	.01
	Girl-Girl	13.66 (.47)	14.47 (.36)	3.25	(1, 103)	.03

* Are significant at $p < .0167$.

The results in Tables 5 and 6 that are relevant to the research questions of the present study are highlighted. It was hypothesized that change in children's fear responses from T1 to T2 may be affected by gender pair type (H4) as well as the difference in anxiety levels between close friends. The interaction between time and gender pairs was significant for children's fear beliefs towards both the animals described as ambiguous and threatening, but not for either behavioural avoidance analyses (H4). Planned additional comparisons indicated that children in boy-boy pairs showed a significant increase in fear beliefs towards the animal described as ambiguous and in avoidance of the animal described as threatening. However, they did not show a significant change in their fear beliefs towards the animal described as threatening and in their avoidance towards the animal described as ambiguous. Children in boy-girl pairs and girl-girl pairs showed no significant change in fear beliefs and behavioural avoidance across time irrespective of information type. Finally, there was no

significant interaction between time and anxiety difference scores in predicting children's fear beliefs and or behavioural avoidance.

Discussion

There is some evidence that children in middle childhood affect each other's fears during peer discussion (Muris & Rijke, 2011). The present study is the first to examine whether close friends respond to verbal information about novel stimuli in a similar way to one another and how they affect each other's fears during the discussion.

First, this study examined how children's fear beliefs and avoidance behaviours regarding novel animals were affected by the threatening and ambiguous information given to them. The results were consistent with the first hypothesis; children reported significantly higher fear beliefs when they were given threatening information about the animal than they did when given ambiguous information. This effect was not observed for avoidance behaviours. Children who were more anxious had higher fear beliefs in both conditions, with the effect of anxiety particularly pronounced in the ambiguous information condition. This finding is consistent with interpretation bias research, in which children with higher levels of anxiety tend to interpret ambiguous stimuli as more threatening than children with lower levels of anxiety (Creswell et al., 2005; Hadwin et al., 1997). Overall, these results are consistent with previous research (Muris et al., 2009), suggesting that the ambiguous and threatening information elicit different levels of fear in children, with children's anxiety affecting their level of fearfulness.

The primary focus of the present study was whether, after being given the information about the novel animals, close friends shared similar patterns of fear beliefs and avoidance, and whether they affected each other's responses following a discussion. The results showed that children in close friendships shared similar patterns of fear beliefs and avoidance, even before they had discussed their responses (H2). Following the discussion, their fear beliefs and avoidance became more similar than they were at pre-test (H3). This

indicates that children in close friendships do exhibit shared patterns of fear-related cognitions, and that they influenced each other's fears during the discussion. These results are consistent with findings from previous research which showed that parents and their children shared similar patterns of interpretation bias (Bögels et al., 2003; Creswell & O'Connor, 2006; Creswell et al., 2005; Creswell, Shildrick, et al., 2011), and that family discussions of ambiguous scenarios affected children's interpretation bias and/or avoidant responses (Barrett et al., 1996; Chorpita & Albano, 1996; Dadds et al., 1996).

Children tend to choose friends who have similar attributes to themselves (social selection) and/or become similar through interactions with each other (mutual socialization) (Hartup, 1996). Rubin, Lynch, Coplan, Rose-Krasnor and Booth (1994) supported this similarity-attraction hypothesis by demonstrating that children who were initially strangers to each other chose partners who were more similar in their sociability and the cognitive maturity of their play, and interacted more frequently with partners than non-partners. Following this reasoning, children in the present study may have become close friends because they share similar attributes with each other, including their fear-related cognitions. This similarity could be maintained or increased over time through their daily interactions, as the results showed following the discussion.

The present study hypothesized two factors that may affect children's change in fear beliefs and avoidance from T1 to T2: the gender pair type and the difference between close friends' levels of anxiety. The results for each of these moderators will be discussed in turn. First, with regards the effects of gender pairs, results revealed that only children in boy-boy pairs showed statistically significant change from T1 to T2. Specifically, children in boy-boy pairs reported higher fear beliefs at T2 than at T1 for the animal described as ambiguous. This fear accentuating effect was not significant when boys were given threatening information, but the direction of effect was the same. Data exploration using scatter plots of the threatening fear beliefs variables at T1 and T2 showed clustering of data points towards

the high scores of the FBQ scale. This indicates that this result was probably affected by ceiling effects in the measurement of children's fear beliefs, after being given threatening information, using the FBQ, therefore any increase in fearfulness from T1 to T2 would not be captured. Additionally, boy-boy pairs showed an increase in avoidance following the discussion for both information types but this was only statistically significant for threatening information. These findings are not consistent with the fourth hypothesis: based on findings from previous research (Muris & Rijke, 2011), we predicted that only boy-boy pairs would show significant change in their fear beliefs and avoidance following the discussion, which was supported, but we expected that boys would become *less* fearful, not more fearful.

Close examination of the mean values shown in Table 4 indicates that relative to the other gender pairs, boy-boy pairs reported unusually low levels of fear beliefs and avoidance at T1. Following the discussion, their levels of fear beliefs and avoidance come to resemble those of children in the gender pairs at T2. This is important for two reasons: first, to highlight that children in boy-boy pairs were not becoming particularly fearful of these animals following the discussion, but were instead reporting levels of fear and avoidance that are typical of other children their age. Second, this pattern of data may provide insight into why an unexpected increase was observed. Previous research (Ollendick, Yang, Dong, Xia, & Lin, 1995) has demonstrated that children perceive their patterns (number, content and intensity) of fears as similar to their best friends', but dissimilar to other classmates. More specifically, boys perceived other boys as more fearful than themselves or their best friends, while girls perceived other girls to be less fearful than themselves or their best friends. Therefore, boys in boy-boy pairs in the present study may have underreported their actual levels of fear beliefs initially due to socially desirable responding, but adjusted their answers at T2 to reflect their actual level of fearfulness after realizing that their close friends were also fearful of the animals during the discussion. In line with this idea, the difference in

findings between the present study and the results reported by Muris and Rijkee (2011) could be explained by the friendship status in pairs of children. In Muris and Rijkee's (2011) study, boys in the discussion condition may have underreported their level of fearfulness, as they perceive themselves to be less fearful than a non-close peer.

In addition, results showed that the difference between friends' anxiety levels does not seem to affect the transmission of fears between close friends. Change in children's fear beliefs and behavioural avoidance following the discussion was not moderated by how discrepant the anxiety scores were between individuals in peer pairs. That is, children were affected equally by the discussion regardless of whether their friend was more or less anxious than they were. This finding is consistent with previous research on depression, which has shown that young adults affect each other's cognitive vulnerability (ruminative responses and hopelessness) after cohabiting as roommates for only three months, but these changes were not influenced either by the participants' or roommates' level of depressive symptoms (Haefel & Hames, 2014). Therefore, it is likely that the observed effects of peer discussion in the present study are influenced by other factors, such as gender pairings as mentioned above, rather than the difference in anxiety levels between friends. This is an important finding as it shows that having a close friend who is more anxious may not necessarily have a negative impact on the child's own anxious cognitions. However, it also indicates that having a friend who is less anxious does not reduce the fear beliefs and avoidant strategies of children who are more anxious. Therefore, having anxious children discuss their fears with friends who are less anxious is unlikely to have a significant benefit for the anxious child.

There are some limitations with the present research and the results should be interpreted with these in mind. For instance, the present study adopted a repeated measures design to measure possible change in children's fear responses across time when presented with different types of information. However, we did not include a non-discussion

control group, which would allow us to determine whether the discussion indeed influenced the change in children's fear responses, or whether the change was due to practice effects. Moreover, although the discussion session was video-recorded, they were not coded to check whether there were differences in the way pairs of children discussed their fears. However, any such discrepancies between pairs are likely to be minimal as the experimenters were present during the session to guide the children through the discussion.

Conclusion

As a whole, there is some indication that close friends in middle childhood influence each other's anxiety-related cognitions, as children's fear responses were correlated at baseline and became significantly more similar after a discussion about fear-related issues. Additionally, results seemed to reveal a '*fear accentuating effect*' in children in boy-boy pairs, whereby the peer discussion increased their level of fearfulness when presented with ambiguous and threatening information. This increase in fearfulness was mainly driven by their initial low levels of fearfulness at T1, with some indication that their fearfulness at T2 was within the normal range as it was comparable to that of children in other gender pairs. Therefore, it is more likely that children in boy-boy pairs may initially underreport their fearfulness and adjust their responses following the discussion with their friend to reflect their actual level of fearfulness. However, this fear accentuating effect was not observed in other gender pairs, plausibly because girls did not underreport their fearfulness at T1 because it may be more socially acceptable for girls to admit to and express their fears (Maccoby, 1980). Finally, the anxiety level between close friends does not seem to influence children's fearfulness following the discussion. Therefore, having a friend who is more anxious or less anxious does not seem determine how fearful children become after discussing fear-related issues. Thus, in the present study, although there is some indication that children may affect each other's fears, it is plausible that other sources of influence, such as parents may still play a considerably larger role in affecting children's fears,

compared to close friends at this age group. Future research could clarify this by extending this work to children in early adolescence.

Chapter 4

Study 3: Do Romantic Partners Affect Each Other's Cognition?

Abstract

The present study aimed to explore whether young adult romantic partners influenced each other's interpretation bias. Young adults (N = 120) first completed an interpretation bias measure on their own. Couples then discussed their responses to a set of four ambiguous scenarios with each other, before completing the interpretation bias measure again separately. Results indicated that although interpretation bias in couples did not become more similar following the discussion, it generally decreased following the discussion. Specifically, young adults generated less threatening interpretations following the discussion, and anticipated that they would feel less negative emotion if the scenarios were to occur to them. However, this decrease in negative emotionality was observed only in those in the younger age group (18.78 – 21.49 years old), while participants in the older age group (21.50 – 31.48 years old) did not report any change in their emotional response following the discussion. Additionally, the difference in anxiety levels between partners, relationship closeness and romantic attachment did not moderate change in interpretation bias in couples. These findings show that young adult couples do affect each other's interpretation bias, plausibly by co-regulating each other's emotions during the discussion.

Introduction

Anxiety disorders are the most prevalent psychological disorders in young adulthood, with 12-month and lifetime prevalence rates of 26.1% (Kim-Cohen et al., 2003) and 15.2% – 30.2% (Kessler et al., 2005; Turner & Gil, 2002), respectively. Young adulthood, a developmental stage defined usually between 17 – 35 years old (Castaneda, Tuulio-Henriksson, Marttunen, Suvisaari, & Lönnqvist, 2008), has been implicated as a risk period for the onset of various psychological disorders including anxiety disorders, with the incidence of these disorders increasing from childhood through mid-adolescence, and peaking in late-adolescence and young adulthood (Newman et al., 1996). Young adults with anxiety disorders show increased risk for later substance dependence or abuse (Chilcoat & Breslau, 1998) and suicide (Yates, 2009), and may experience significant functional impairment, such as educational and occupational impairment (Kessler, 2003) and poor quality of life (Beard, Weisberg, & Keller, 2010). Young adulthood is a crucial period for prevention and treatment interventions as anxiety at this age tends to persist into later life (Kessler et al., 2005; Newman et al., 1996).

Several cognitive theories have proposed that information processing biases play a central role in the onset and/or maintenance of anxiety disorders (Beck et al., 1985; Mathews & MacLeod, 2005; Muris & Field, 2008). There is substantial evidence from early research demonstrating that anxiety is associated with an interpretation bias (Amir, Foa, & Coles, 1998; Eysenck et al., 1991; Richards & French, 1992), with anxious individuals more likely than non-anxious individuals to interpret ambiguous stimuli as threatening. Research using cognitive bias modification (CBM) has shown that participants who were trained to interpret ambiguity as threatening responded with higher anxiety to a subsequent emotional event compared to those who were trained to interpret ambiguity as not threatening (Wilson, MacLeod, Mathews, & Rutherford, 2006). Moreover, training highly anxious participants to have a benign interpretation bias resulted in a reduction in their trait

anxiety symptoms (Mathews, Ridgeway, Cook, & Yiend, 2007). Overall, these studies and similar others (e.g., Mathews & Mackintosh, 2000; Salemink et al., 2007) seem to suggest that interpretation bias may play a causal role in the development and/or maintenance of anxiety.

Thus far, the origins of anxiety-related cognitions remain unclear. Research in genetic epidemiology estimates that approximately 30% - 40% of the variance in anxiety disorders is explained by genetic heritability (Hettema et al., 2001), leaving a substantial role for environmental factors in explaining the development and/or maintenance of anxiety. One example of an environmental factor that may affect risk for anxiety is the transmission of anxious cognitions from one individual to another via verbal information transfer (Drake & Ginsburg, 2012; Hadwin et al., 2006). The majority of research in this area has focused on the transfer of cognitions from parents to their children. A number of studies have shown that parents and their children share similar levels of interpretation bias (Bögels et al., 2003; Creswell & O'Connor, 2006; Creswell et al., 2005; Creswell, Shildrick, et al., 2011), although others have failed to find this association (Creswell et al., 2006; Gifford et al., 2008). Further evidence for the transmission of anxious cognitions from parents to their children comes from early research demonstrating that children's interpretation bias and/or avoidant responses are enhanced following a discussion with their parents (Barrett et al., 1996; Chorpita & Albano, 1996; Dadds et al., 1996). For instance, Chorpita and Albano (1996) found that parent anxious verbalizations (e.g. interpretation, questions, agreement) enhanced child interpretation bias and avoidant behaviours following the discussion of ambiguous scenarios. Consistent with the above, recent research reported that children who had higher levels of interpretation bias had parents who were more likely to end stories for their child in a threatening way (Ooi, Dodd & Walsh, 2015).

In addition to the intergenerational transmission of anxiety-related cognitions, there is also indication that close friends in middle childhood affect each other's fear-related

cognitions. Ooi, Dodd, Walsh and Broeren (in Chapter 3) showed that close friends share similar levels of fear-related cognitions and that these cognitions become more similar following a discussion together. Similarly, Haefel and Hames (2014) found that young adults affected each other's cognitive vulnerability (ruminative responses and hopelessness) after cohabiting as roommates for only three months. In line with these findings, it is also plausible that the transmission of anxiety-related cognitions may occur in other forms of close relationships. Romantic relationships are important in young adulthood, and are usually characterized by intimacy, passion and commitment (Sternberg, 1988). As young adult partners interact regularly with each other, they may also influence each other's anxiety-related cognitions. Research examining affect regulation indicates that romantic couples in adulthood (aged 25 – 57 years) may influence each other when they discuss their worries together, resulting either in reassurance or the worries being taken on and shared by both partners (Simons & Parkinson, 2009). It is plausible that this affect may extend to anxiety-related cognitions. When couples discuss ambiguous situations together, they may influence their partners' interpretation bias, making it more or less negative.

Previous research found that adults who conversed with a clinically depressed person experienced higher negative affect (depressed, anxious and hostile moods), compared to those who conversed with non-depressed clinical patients or non-clinical controls (Coyne, 1976). Hence, it is plausible that differences in trait anxiety levels between young adult partners may affect the transmission of anxiety-related cognitions between young adult partners. When partners discuss ambiguous situations together, young adults with higher levels of anxiety are more likely to make threatening interpretations than their less anxious partner. Therefore, they may adjust their own interpretation to become less threatening, persuade their less anxious partner to adopt a more threatening interpretation, or remain unaffected by the interaction. This however, has yet to be explored.

Factors specific to each relationship, such as relationship closeness and romantic attachment styles, may also affect the transmission of anxiety-related cognitions in young adult partners. For instance, van Orden and Joiner (2006) proposed that relationship closeness could be a potential moderator in the transmission of negative affect between romantic partners. As couples high in closeness tend to share their thoughts and feelings more frequently with each other (Robinson & Blanton, 1993), it is likely that they transmit their affect or cognitions to each other when they communicate. Research on emotional concordance in older married couples showed that changes in the level of depressive symptoms of the spouse predicted participants' change in their own levels of depressive symptoms, but only in couples that reported high relationship closeness (Tower and Kasl, 1996). Thus, it is plausible that relationship closeness may also facilitate the transmission of anxiety-related cognitions in young adult couples. Moreover, there is evidence that attachment anxiety is positively associated with help seeking behaviours (Vogel & Wei, 2005). As adults tend to use their romantic partners as a secure base in times of stress (Hazan & Shaver, 1987), those with high attachment anxiety may be more likely to seek help and advice from their partners at times of uncertainty, which may allow for the transmission of anxiety-related cognitions between partners.

The present study aimed to explore whether young adults share similar patterns of interpretation bias, and whether they affect each other's anxiety-related cognitions when they discuss ambiguous scenarios together. Couples first completed an interpretation bias measure on their own, which consists of eight ambiguous scenarios. They then discussed their responses to half of the scenarios used in the interpretation bias measure with each other, before completing a further interpretation bias measure separately. Interpretation bias was measured using the Interpretation Generation Questionnaire (IGQ; Dodd, Stuijzand, Morris, & Hudson, 2015), which assesses the generation of interpretations to ambiguous scenarios, the selection of the most likely interpretation, and the anticipated

emotional response when faced with the ambiguous scenario. In the present study, only participants' interpretation generation and emotional response rating were measured as Dodd et al.'s (2015) research showed no evidence for the association between interpretation selection and anxiety symptoms. The hypotheses evaluated for the present study were as follows. First, it was hypothesized that young adult partners will share similar patterns of interpretation bias (interpretation generation and emotional response rating), therefore, there will be significant correlations between couple's interpretation bias at T1(H1). Moreover, it was hypothesised that the correlation between couple's interpretation bias (interpretation generation and emotional response rating) will become more similar after the discussion, thus the correlation between partners' interpretation bias will be significantly stronger at T2 than at T1 (H2). We further hypothesized that young adults' interpretation bias will show greater change from T1 to T2 in the specific scenarios discussed than in scenarios not discussed (H3); the direction of this change will be exploratory as there is no previous research to base the hypothesis on. We were also interested to explore whether the different levels of anxiety between partners, their perceived relationship closeness and attachment anxiety moderated change in interpretation bias as a result of the discussion. These analyses were exploratory.

Method

Participants

One hundred and twenty young adults (60 heterosexual romantic couples) aged between 18.78 years to 31.48 years ($M = 22.13$, $SD = .24$) volunteered to take part after hearing about the study via posters and leaflets distributed at the university campus, advertising at the university's e-bulletin (both staff and students) and the university employability website, as well as through friends who had also taken part. The length of their current relationship ranged from 6 months to 11.41 years ($M = 2.21$ years, $SD = 2.23$ years), and the majority (81.7%) of the participants identified as white British.

Measures

Interpretation bias. The Interpretation Generation Questionnaire (IGQ; Dodd et al., 2015) (refer to Appendix 8) comprises of eight ambiguous scenarios that assess the generation, selection and anticipated emotional response to ambiguous everyday situations. Half the scenarios describe social situations (e.g. You walk into a party and people turn to look at you, why?), while the other half describe non-social situations (e.g. You're lying in bed at night when you hear a noise, what might it be?) to capture the range of situations typically encountered by young adults. Interpretation generation was measured by asking participants to imagine that the scenarios were happening to them, and to list all the explanations they could think of, up to a maximum of ten interpretations per scenario. Subsequently, anticipated emotional response was measured by asking participants to rate how they would feel if each of the interpretation they generate was actually happening to them, using a Likert scale ranging from -3 (very bad) to 3 (very good). Although the IGQ also measures interpretation selection (the interpretation participants thought was most likely to happen), this was not included in the present study as previous research found no significant association between interpretation selection and anxiety symptoms (Dodd et al., 2015).

Coding of IGQ responses. Each interpretation generated by participants was coded either as threat or non-threat. Interpretations were coded as 'threatening' if they suggested a threat-related outcome for the participant or reflected negative attributions to the self. Refer to Appendix 9 for the coding scheme of the IGQ. **Interpretation generation** was calculated as the proportion of interpretations that were threatening (total number of responses that were threatening divided by the total number of interpretations made). Additionally, an **emotional response rating** was calculated as the average of participants' emotional response ratings (sum of emotional response ratings divided by the total number of ratings made).

A research intern who was blind to participant anxiety level coded all the

interpretations generated at both baseline and post-test. To ensure reliability, interpretations from 25% of the participants selected at random were second-coded by the first author. Inter-rater reliability for interpretation generation at baseline and post-test were ICC (2, 1) = .84 and .84 respectively. Internal consistency for interpretation generation at both T1 and T2 in the present sample was Cronbach's alpha = .52 and .56 respectively, while internal consistency for emotional response at both T1 and T2 was Cronbach's alpha = .66 and .62 respectively.

State and trait anxiety symptoms. Participants completed the State-Trait Anxiety Inventory, (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), consisting of both the 20-item self-report measures of state (STAI-S) and trait (STAI-T) anxiety. The STAI-S assesses "feelings of apprehension, tension, nervousness and worry" (Spielberger et al., 1983, p. 6) felt at a particular time, while the STAI-T measures "relatively stable individual differences in anxiety proneness and refers to a general tendency to respond with anxiety to perceived threats in the environment" (Spielberger et al., 1983, p.3). The STAI-S was measured at three time-points in the present study: during the online questionnaire measurement, before and after the discussion, while the STAI-T was measured only at the online questionnaire measurement. Both the subscales have strong internal consistency, while test-retest reliability is reasonably high for the STAI-T and relatively low for the STAI-S (Spielberger et al., 1983). Internal consistency for the STAI-S and STAI-T for this sample ranged from Cronbach's alpha = .92 -.94.

Relationship closeness. Participants completed the Unidimensional Relationship Closeness Scale (URCS; Dibble, Levine, & Park, 2012), a 12-item self-report measure that assesses relational closeness. The URCS has strong internal consistency and good test-retest reliability. Internal consistency for this sample was Cronbach's alpha = .91. Participants also completed the Inclusion of Other in the Self Scale (IOS; Aron, Aron, & Smollan, 1992), which is a single-item measure assessing closeness using Venn-like diagrams to represent

respondent's relationship with their partner. A relationship closeness score was calculated by averaging the IOS item along with the 12 URCS items, as recommended by Dibble et al. (2011).

Attachment Style. Participants completed the Experiences in Close Relationship Scale Short Form (ECR-SF; Wei, Russell, Mallinckrodt, & Vogel, 2007), a 12-item self-report measure that assesses the general pattern of adult romantic attachment along two dimensions - anxiety and avoidance. The ECR-SF has strong test-retest reliability and good internal consistency for the Anxiety subscale. Internal consistency for the Anxiety subscales in this sample was Cronbach's alpha = .70.

Procedure

The School of Psychology Research Ethics Committee at the University of East Anglia approved the methods of the study. At baseline (T1), participants completed the IGQ, URCS, ECR-SF, STAI-T, and STAI-S independently in an online questionnaire. Each couple then attended a 1-hour experimental session together at the University. During the experimental session, the couples first completed the STAI-S measure again individually, before joining each other for the discussion task. The discussion session was audio recorded and the experimenter was not present during the session to allow the couples to have a naturalistic discussion. The couples discussed four of the eight ambiguous situations from the IGQ (two social and two non-social scenarios) together. The same four scenarios were used in the discussion for all couples. During the 15- to 20-minute discussion, partners were asked to take turns and to each generate 5 possible explanations for each scenario, stating whether they agreed with each other's explanations and their reasons for the agreement/disagreement. Therefore, each couple discussed a total of 40 possible explanations for the four ambiguous scenarios. Finally, at post-test (T2), the couples

completed the IGQ again, as well as the STAI-S. Participants were then thanked and reimbursed for their time.

Results

Data Preparation

The IGQ initially yielded 4 continuous variables: interpretation generation and emotional response rating at T1 and T2. For the purpose of exploring change following the discussion, these variables were further split into responses relating to the 4 ambiguous situations used in the discussion and those that were not, giving a total of eight continuous variables from the IGQ. Additionally, to examine whether the difference in trait anxiety between partners moderated the effect of the discussion, an anxiety difference variable was computed by subtracting a partner's anxiety score from an individual's own, thus positive scores indicate participants who are more anxious than their partners and negative scores indicate participants who are less anxious than their partners. The STAI-T was positively skewed, while the relationship closeness variable was negatively skewed. Therefore, analyses involving these variables were bootstrapped, and estimates using 1000 bootstrapped samples were reported.

Preliminary Analyses

The demographic variables collected were gender, age, ethnicity, and the length of participants' current relationship. Preliminary analyses showed the following. Women consistently reported more negative emotional response ratings than men. Age was significantly correlated with both interpretation generation ($r = -.23, p = .01$) and emotional response rating ($r = .28, p < .005$) at T1, with older participants making less negative interpretations and anticipating more positive emotion. Trait anxiety was significantly correlated with interpretation generation and emotional response rating at T1, $r = .31, p < .005$ and $r = -.34, p < .001$ respectively and at T2, $r = .32, p < .001$ and $r = -.31, p < .005$

respectively. Moreover, state anxiety was correlated with interpretation generation and emotional response rating at both time-points, $r = .30, p < .005$ and $r = -.27, p < .005$ respectively at T1, and $r = .32, p < .001$ and $r = -.32, p < .001$ respectively at T2. State anxiety was significantly lower when the IGQ was completed at T2 ($M=32.18, SD = 9.15$), compared to when the IGQ was completed at T1 ($M=36.71, SD = 11.38$), $t(119) = 5.04, p < .001, d = .47$. State anxiety also decreased slightly from pre- ($M=33.05, SD = 8.53$) to post-discussion ($M=32.18, SD = 9.15$), $t(119) = 1.93, p = .056, d = .18$. No other demographic variables were significantly related to scores on the IGQ, STAI-T, ECR-SF, relationship closeness variable or the anxiety difference variable.

Analyses

To examine whether couples share similar patterns of interpretation bias at baseline (T1) (H1), and whether their interpretation bias becomes more similar following the discussion (from T1 to T2) (H2), bivariate correlations were conducted to explore the relationship between IGQ scores in partners at T1 and at T2. Next, Z Statistics were used to compare the correlations between partner's IGQ scores at T1 and at T2. Table 1 shows that the IGQ scores between partners were not correlated at T1 (H1), and that the correlations did not become significantly stronger from T1 to T2. These findings suggest that couples did not share similar patterns of interpretation generation and emotional response ratings at baseline, and that these cognitions did not become more similar following the discussion.

Table 1

Pearson's Correlations for the IGQ Variables Between Partners, and the Z-Statistics Indicating Change in the Correlation between Partners' IGQ Scores from T1 to T2

		Generation Discussed		Generation Not Discussed		Emotional Response Discussed		Emotional Response Not Discussed		T1 vs, T2 Z-Statistics
		T1	T2	T1	T2	T1	T2	T1	T2	
		Generation Discussed	T1	0.07						
	T2		0.14							
Generation Not Discussed	T1			0.02						z = .44
	T2				0.09					
Emotional Response Discussed	T1					-0.01				z = 1.53
	T2						0.24 ‡			
Emotional Response Not Discussed	T1							0.01		z = .40
	T2								0.07	

* Are significant at $p < .05$. ** Are significant at $p < .01$. ‡ Are close to significant ($p < .066$).

Table 2

Descriptive Statistics for IGQ Variables by Condition and Time

	Condition	M (SD)	
		T1	T2
Interpretation Generation	Discussed	.27 (.12)	.24 (.08)
	Not Discussed	.32 (.11)	.29 (.10)
Emotional Response	Discussed	-.17 (.54)	-.08 (.43)
	Not Discussed	-.71 (.50)	-.69 (.45)

Note: Disc = Discussed, Not Disc = Not Discussed

Table 2 shows the means and standard deviations for interpretation generation and emotional response rating by condition and time. To explore whether young adults' interpretation bias showed greater change from T1 to T2 in the scenarios discussed compared to the scenarios not discussed (H3), as well as whether the difference between couples' anxiety levels affect change in their interpretation bias from T1 to T2, a 2 (Time: T1 or T2) x 2 (Condition: Discussed or Not Discussed) mixed ANCOVA analysis was conducted, with the difference in anxiety scores between partners and age as two covariates. This analysis was first conducted with interpretation generation as the dependent variable,

followed by emotional response rating as the dependent variable. Age was included as a covariate because preliminary analyses showed that this variable correlated with both interpretation generation and emotional response rating. As preliminary analyses also showed gender differences in emotional response rating, gender was included as an additional covariate for both analyses (when interpretation generation and emotional response rating were dependent variables respectively) to allow for comparability across these analyses. The results of these analyses are presented in Table 3.

Table 3

Analyses for the Effects of the Discussion

	Main/ Interaction Effects	<i>F</i>	<i>df</i>	<i>partial η</i> ²
Generation	Time	1.63	(1,114)	0.01
	Condition	0.07	(1,114)	<.005
	Trait Anxiety Difference	4.88*	(1,114)	0.04
	Age	5.66*	(1,114)	0.05
	Gender	0.52	(1, 114)	0.01
	Time x Condition	3.97*	(1,114)	0.03
	Time x Trait Anxiety Difference	0.56	(1,114)	0.01
	Time x Age	0.50	(1,114)	<.005
	Time x Gender	2.88	(1,114)	0.03
	Time x Condition x Trait Anxiety Difference	0.54	(1,114)	0.01
	Time x Condition x Age	3.95*	(1,114)	0.03
	Time x Conditions x Gender	<.005	(1, 114)	<.001
Emotional Response	Time	5.67*	(1,114)	0.05
	Condition	3.79 ‡	(1,114)	0.03
	Trait Anxiety Difference	8.55**	(1,114)	0.11
	Age	5.25*	(1,114)	0.04
	Gender	8.05**	(1,114)	0.07
	Time x Condition	5.33*	(1,114)	0.05
	Time x Trait Anxiety Difference	0.09	(1,114)	<.005
	Time x Age	4.82*	(1,114)	0.04
	Time x Gender	0.97	(1,114)	0.01
	Time x Condition x Trait Anxiety Difference	0.32	(1,114)	<.005
	Time x Condition x Age	4.39*	(1,114)	0.04
	Time x Condition x Gender	<.001	(1,114)	<.001

* Are significant at $p < .05$. ** Are significant at $p < .01$. ‡ Are close to significant ($p < .066$).

To highlight the hypotheses tested in the present study (H3), there was a significant interaction between time, condition and age for both IGQ variables. To explore these interactions further, a median split was applied to the age variable, categorizing participants into either the younger (18.78 – 21.49 years old) or older (21.50 – 31.48 years old) age groups. For both IGQ dependent variables, two 2 (Time: T1 or T2) x 2 (Condition: Discussion or Non-discussion) mixed ANCOVA analyses were then conducted, one for each age group, with the difference in anxiety scores between partners as a covariate. Again, gender was included as an additional covariate for the analyses when emotional response rating was the dependent variable. The results of these analyses are presented in Table 4.

Table 4

Further exploration of the interaction between Time, Condition and Age, results show the main effect of time, condition and the interaction between time and condition, by age groups

DV	Age Group	Main/ Interaction Effects	F	df	partial η^2
Generation	Younger	Time	12.61**	(1,58)	0.18
		Condition	11.00**	(1,58)	0.16
		Time x Condition	1.99	(1,58)	0.03
	Older	Time	10.32**	(1,58)	0.15
		Condition	23.15**	(1,58)	0.29
		Time x Condition	1.77	(1,58)	0.03
Emotional Response	Younger	Time	6.18*	(1,57)	0.10
		Condition	158.84**	(1,57)	0.74
		Time x Condition	5.70*	(1,57)	0.09
	Older	Time	<.001	(1,55)	<.001
		Condition	93.32	(1,55)	0.63
		Time x Condition	0.21	(1,55)	<.005

* Are significant at $p < .05$. ** Are significant at $p < .01$. † Are close to significant ($p < .066$). Note: Disc = Discussed, Not Disc = Not Discussed

As shown in Table 4, there was a significant main effect of time on interpretation generation across age groups. Participants in both the younger ($M_{T1} = .31$, $SD_{T1} = .11$; $M_{T2} = .27$, $SD_{T2} = .09$) and older ($M_{T1} = .28$, $SD_{T1} = .11$; $M_{T2} = .25$, $SD_{T2} = .09$) age groups generated significantly fewer threatening interpretations following the discussion. The time by

condition interaction was not significant for either the younger or older age group, indicating that this effect of the discussion on interpretation generation was found across all scenarios, not just those that were discussed. For emotional response rating, there was a significant interaction between time and condition for the younger age group but not the older age group; no effect of time was found for the older age group either. None of the interactions with the covariates were significant, so they were not reported here.

To examine the time by condition interaction on the younger age group's emotional response rating, post-hoc comparisons were conducted by running repeated measures ANCOVA analyses for each condition (Discussed vs. Not Discussed), with time as a repeated measures variable, and the difference in anxiety scores between partners and gender as covariates. Results showed that emotional response rating for the younger age group became significantly less negative from T1 ($M = -.29, SD = .58$) to T2 ($M = -.12, SD = .44$) for the scenarios that were discussed, $F(1, 57) = 11.13, p < .005, \text{partial } \eta^2 = .16$, but no significant change was observed for the scenarios that were not discussed, $F(1, 57) = .24, p = .63, \text{partial } \eta^2 < .005$.

Additionally, to explore whether perceived relationship closeness and attachment anxiety moderated the extent of change observed for the discussed scenarios, bivariate correlations were conducted between the relationship factors and change scores (T1-T2) for both interpretation generation and emotional response rating. Results showed no significant correlation between relationship closeness and change scores for interpretation generation, $r = -.01, p = .92$, or emotional response rating, $r = .07, p = .42$, respectively. Similarly, there were no significant correlations between attachment anxiety and change scores for both interpretation generation, $r = .04, p = .68$, and emotional response rating, $r = .09, p = .34$.

Discussion

There is some evidence that individuals in close relationships affect each other's anxiety-related cognitions following a discussion (Barrett et al., 1996; Chorpita & Albano, 1996; Dadd et al., 1996; Ooi, Dodd, Walsh, Broeren, in Chapter 3). The present study is the first to explore whether young adults in romantic relationships also affect each other's interpretation bias when they interact with each other.

First, the present study examined whether partners shared similar patterns of interpretation bias (H1), and whether they became more similar following the discussion (H2). The results did not support these hypotheses. Young adult partners did not have similar patterns of interpretation generation and emotional response rating at T1, and there was no evidence that their interpretation generation and emotional response ratings became more similar following the discussion. These findings are not consistent with previous research showing that children share similar levels of anxiety related cognitions with their parents (Bögels et al., 2003; Creswell & O'Connor, 2006; Creswell et al., 2005; Creswell, Shildrick, et al., 2011), and their close friends (Ooi, Dodd, Walsh and Broeren, in Chapter 3) or that anxious cognitions change after a discussion with parents (Barrett et al., 1996; Chorpita & Albano, 1996; Dadds et al., 1996) and close friends (Ooi, Dodd, Walsh & Broeren, in Chapter 3).

We also examined whether young adults' interpretation bias changed following the discussion. Results showed that young adults generated significantly fewer threatening interpretations to ambiguous situations after the discussion than they did at baseline. This was true for the scenarios that were discussed as well as those that were not discussed. This suggests that the effects of the discussion generalized beyond the scenarios that were discussed, resulting in a reduction in threat interpretations in the scenarios that were not discussed. In contrast, this generalization was not observed in young adults' emotional response. Participants in the younger age group reported significantly less negative

emotional response ratings after the discussion, but this reduction in negative emotionality was limited to the scenarios that were discussed and did not extend to older adults. These findings provide some initial evidence that the different processes of interpretation bias may differ in their susceptibility to influence, with interpretation generation showing greater generalizability to change than emotional response. Thus, young adults' interpretation generation could be a more effective target for modification efforts than their anticipated emotional response. It is also plausible that this difference in findings between interpretation generation and emotional response is due to the nature of the discussion, which mainly focussed on generating explanations but not emotional responses to the ambiguous scenarios.

Additionally, there were age-related differences in how the discussion affected young adults' emotional response. The reduction in negative emotionality following the discussion was observed in the younger age group only, while no significant change in emotional response ratings was observed in the older age group. This suggests that emotional response in the younger age group was more susceptible to change compared to the older age group. Haeffel and Hames (2011) suggest that cognitive vulnerability is susceptible to change during life transitions when individuals are exposed to novel social situations for an extended period, such as moving to university. Emotional response towards potential threat may be more vulnerable to influence during these transitional periods, which may explain why change was only observed in the younger age group who were likely to be adjusting to life at university, while those in the older age group were likely to have established a more stable environment. It is important to note however, that the reduction in threat interpretations following the discussion did not differ across age groups. Therefore, although participants in the older age group generated fewer threatening interpretations following the discussion, they did not show a similar reduction in the negativity of their emotional response ratings. Instead, they showed no significant change in their emotional

response ratings across time. This implies that emotional response may not necessarily be a direct response of the interpretations that were generated, but could plausibly be distinct processes of interpretation bias that partially co-varies with interpretation generation.

As a whole, the results showed that although young adults couples' interpretation bias did not become more alike after the discussion, they did influence each other's biases during the discussion, resulting in a reduction of threatening interpretations and anticipated negative emotion, at least in younger participants. Thus, young adult couples may have engaged in co-regulation of each other's emotions through cognitive reappraisal when discussing the ambiguous scenarios, which involves changing the way they think about potentially anxiety-provoking situations and decreasing the emotional impact of these situations (John & Gross, 2004). That is, they may have encouraged each other to think about the ambiguous scenarios in a less threatening manner, and to feel less negatively about the scenarios occurring to them. Additionally, state anxiety was lower when the participants completed the IGQ at T2 (post discussion), compared to when they completed the IGQ at T1 (online baseline). There was also a slight decrease in state anxiety from pre to post discussion, although this did not reach statistical significance. Given that state anxiety was significantly associated with interpretation generation and emotional response rating, change in interpretation generation and emotional response ratings across time may have been driven by participants' lower levels of state anxiety when completing the IGQ at T2. This does not detract from the results because the discussion still had a positive effect on participants' interpretation bias but it should be considered that this effect could have occurred because the discussion reduced participants' state anxiety. Alternatively, it is also plausible that the decrease in anxiety-related cognitions during the discussion caused a reduction in state anxiety. This latter interpretation would be consistent with cognitive bias modification research whereby training participants to make benign interpretations significantly decreased their anxiety symptoms (Mathews et al., 2007).

We also explored three factors that may affect whether young adults change their interpretation generation and emotional response rating: the difference between partners' levels of anxiety, their perceived relationship closeness and their levels of attachment anxiety. The results of each of these moderators will be discussed in turn. First, results indicate that the difference between partners' anxiety levels did not affect whether young adults influenced each other's interpretation generation or emotional response rating. Thus, irrespective of whether their partner is more or less anxious than they are, the young adults seemed to be equally affected by the discussion. This is consistent with research mentioned above, showing that neither the participants' nor the roommate's level of depressive symptoms predicted the change in their cognitive vulnerability over time (Haefel and Hames, 2014). This finding is important as it indicates that having a romantic partner who is more anxious may not necessarily have a negative impact on a young adult's own anxiety-related cognitions.

Further to the above, there was also no evidence that relationship closeness or attachment anxiety influenced the extent to which young adults' interpretation generation and emotional response ratings were affected by the discussion. This finding did not support previous research, which suggested that relationship closeness might moderate the transmission of depressive symptoms between married couples over time (van Orden & Joiner, 2006; Tower & Kasl, 1996). It is plausible that this moderation effect may be limited to emotional symptoms but not participants' cognitions, or that the effect may take place over a longer period of time rather than during a brief lab-based discussion. Similarly, the finding also did not support the notion that attachment anxiety may facilitate the transmission of anxiety-related cognitions when young adult couples discuss ambiguous scenarios.

There are some limitations with the present study and the results should be interpreted with these in mind. First, some scenarios in the IGQ generated higher threat

interpretations and more negative emotional responses than others. For example, emotional response ratings at T1 were more negative for the scenarios not used in the discussion ($M = -.71, SD = .50$), compared to the scenarios used in the discussion ($M = -.17, SD = .54$). However, change in young adults' interpretation following the discussion was not affected by this discrepancy as their scores at T1 and T2 were compared using the same scenarios throughout. Second, the findings are limited to heterosexual couples and cannot necessarily be extended to homosexual couples. Finally, although the discussion task was audio recorded, the recordings were not coded to check whether the couples were on task with their discussion. However, to check that the couples generated and discussed the required number of responses together, the participants were each given a list of ambiguous scenarios they were required to discuss and asked to tick a checkbox after discussing each response with their partner.

Conclusion

Taken together, findings from the present study indicate that young adult romantic partners affect each other's anxiety-related cognitions when they discuss ambiguous situations. Although there was no evidence that their cognitions became more similar over time, results showed that young adults generated fewer threatening interpretations after the discussion, suggesting that couples may have co-regulated their emotions during the discussion. Results also showed that having a partner who is more anxious might not accentuate young adults' anxiety-related cognitions. Instead, young adult couples may dampen each other's anxiety related cognitions regardless of their levels of anxiety. Finally, the findings indicated that relationship closeness and attachment anxiety did not influence the extent to which partners affect each other's interpretation bias.

Chapter 5

Study 4: Shared Cognition in Anxiety: Interpretation Bias in Young Adults and their Parents

Abstract

The present study aimed to examine whether young adults and their parents shared similar patterns of interpretation bias. Eighty-eight pairs of young adults and their parents completed an online questionnaire on their own, which measured their interpretation bias and anxiety. Young adult participants also completed additional measures of relationship closeness and parental attachment. Results showed that interpretation bias between parents and their young adult children was significantly correlated. Moreover, relationship closeness and parental attachment moderated the relationship between parent-child emotional response ratings, but not the relationship between their interpretation generations. Contrary to the prediction of the study, the relationship between parents' and young adults' emotional response ratings emerged only when young adults reported low levels of relationship closeness or attachment security to their parents, but not in those who reported high closeness or attachment security. Overall, these findings suggest that parents may play a role influencing their children' anxiety-related cognitions even in young adulthood.

Introduction

Cognitive theories propose that biased information processing plays a crucial role in anxiety (Beck, Emery, & Greenberg, 1985; Mathews & MacLeod, 2005; Muris & Field, 2008). A large body of evidence shows that anxiety is associated with an interpretation bias, which is a tendency to interpret ambiguous stimuli in a threatening manner (Butler & Mathews, 1983; Eysenck, Mogg, May, Richards, & Mathews, 1991; Richards & French, 1992). Research using cognitive bias modification (CBM) generally supports the idea that interpretation bias may play a causal role in the onset and/or maintenance of anxiety disorders (e.g., Mathews & Mackintosh, 2000; Salemink, van den Hout, & Kindt, 2007). For instance, Wilson, MacLeod, Mathews and Rutherford (2006) found that participants who were trained to interpret ambiguity as threatening responded with higher anxiety to a subsequent emotional event compared to those who were trained to interpret ambiguity as not threatening. Similar research also found that training highly anxious participants to have a benign interpretation bias resulted in a reduction in their trait anxiety symptoms (Mathews, Ridgeway, Cook, & Yiend, 2007).

Currently, the origins of interpretation bias are still unclear. One option is that the environment may affect children's tendency to interpret ambiguity as threatening. There are several ways in which this might occur but one relevant pathway that has been hypothesised is via the verbal transmission of biased information processing from parents to their children (Drake & Ginsburg, 2012; Hadwin, Garner, & Perez-Olivas, 2006). Anxious parents may inadvertently transmit their interpretation bias to their children through verbal communication. If this occurs, we would expect to see an association between a parents' own bias and their child's bias. A body of research has examined this question and indicated equivocal results, with some studies reporting that parents and their children exhibit similar interpretation biases (Bögels, van Dongen, & Muris, 2003; Creswell & O'Connor, 2006; Creswell, Schniering, & Rapee, 2005; Creswell, Shildrick, & Field, 2011), and others failing to

find this association (Creswell, O'Connor, & Brewin, 2006; Gifford, Reynolds, Bell, & Wilson, 2008). In addition, if anxious parents affect their children's information processing, we would expect that children's interpretation bias and/or avoidant responses would be enhanced following a discussion with their parents. There is some support for this (Barrett, Rapee, Dadds, & Ryan, 1996; Chorpita & Albano, 1996; Dadds, Barrett, Rapee, & Ryan, 1996). For instance, Chorpita and Albano (1996) found that parent anxious verbalizations (e.g. interpretation, questions, agreement) enhanced child interpretation bias and avoidant behaviours following the discussion of ambiguous scenarios. In line with the above, recent research also found that young children who had higher levels of interpretation bias had parents who were more likely to end stories for their child in a threatening way (Ooi, Dodd, & Walsh, 2015).

Thus far, research in this area has focussed on children in middle to late childhood (with the exception of Ooi et al. (2015) which focuses on preschool-aged children), and it is unclear whether parents' anxious cognitions may continue to affect their children's interpretation bias into early adulthood. Parent-child interactions tend to show continuity over time from childhood to young adulthood (Aquilino, 1997; Rossi & Rossi, 1990; Whitbeck, Hoyt, & Huck, 1994) and, as parents remain an important source of support for their children in young adulthood (Da Vanzo & Goldscheider, 1990), it is likely that they continue to exert some influence on their child's interpretation bias even when they are young adults. There is evidence that anxiety-related cognitions in children and adolescents show moderate stability over time (Creswell & O'Connor, 2011; Creswell et al., 2011; Muris, Jacques, & Mayer, 2004), suggesting that these biases may have consolidated and are relatively resistant to change by young adulthood. However, it should be emphasized that young adults' biases are not immutable to change. Haefel and Hames (2014) argue that cognitive biases are susceptible to influence during life transitions when individuals are exposed to novel social contexts for an extended period of time, such as moving to

university in young adulthood. The authors showed that college roommates affected each other's cognitive vulnerability towards depression (ruminative responses and hopelessness) after cohabitating for only three months. Similarly, research on affect regulation has indicated that romantic couples influence each other when they discuss their worries together, resulting either in reassurance or the worries being taken on and shared by both partners (Simons & Parkinson, 2009). More recently, Ooi, Dodd and Walsh (in Chapter 4) also found that romantic couples influenced each other's anxiety-related cognitions following a discussion about ambiguous scenarios, with young adults generating fewer threatening interpretations and anticipating less negative emotion in response to the scenarios following the discussion. These studies demonstrate that cognitions in young adults can be affected by people they share a close relationship with. To date, however, no research has examined whether young adults' parents might affect their cognitions.

Although parents may have greater influence on their children earlier in life (Fox, Henderson, Marshall, Nichols, & Ghera, 2005), there is evidence that parents remain influential as their children progress to young adulthood. For instance, young people report increasing closeness to their parents as they transition from adolescence to young adulthood (Rossi & Rossi, 1990; Thornton, Orbuch, & Axinn, 1995), plausibly because young adults begin to share similar life experiences to their parents that allows for increased mutuality in the relationship (Bengtson & Black, 1973). Sullivan and Sullivan (1980) found that young adults who reported greater feelings of affection for their parents also communicated more frequently after moving away for university. Therefore, as young adults who report high closeness tend to share their thoughts and feelings frequently with their parents, it is likely that they may acquire anxiety-related cognitions from their parents when they communicate. Similarly, there is also evidence that parents remain an important secure base for young adults to seek advice and support when needed. Young adults with higher attachment security are more likely to seek help from their parents in stressful situations

(Kenny, 1987), and the greater parent-child communication resulting from the advice and support seeking may encourage young adults to think about potentially threatening situations in a similar manner as their parents. This demonstrates that parents may continue to be an important factor when considering causal and maintenance factors for anxiety, and anxiety-related cognitions in young adults. Furthermore, it highlights that individuals will differ in the extent of continued relationship closeness as well as attachment security, both of which might affect the intergenerational transmission of interpretation bias.

The present study aimed to explore whether young adults' interpretation bias is associated with their parents' interpretation bias. Interpretation bias was measured using the Interpretation Generation Questionnaire (IGQ; Dodd, Stuijzand, Morris, & Hudson, 2015), which assesses the generation of interpretations of ambiguous scenarios and anticipated emotional response when faced with the ambiguous scenario. The hypotheses evaluated for the present study were as follows. First, young adults' and parents' interpretation generation, as well as their emotional response ratings will be significantly correlated (H1). We were also interested to explore whether young adults' perceived relationship closeness and parental attachment moderated the relationship between young adult and their parents' interpretation bias. Given the lack of previous research addressing this question, we tentatively hypothesized that the association between interpretation bias in parents and their children would be stronger when children reported greater relationship closeness and/or more secure attachment (H2).

Method

Participants

One hundred and seventy-six participants (88 pairs of young adults and their parents) took part in the study. The young adults (74 women, 14 men) were aged between 17.40 years to 30.64 years ($M = 22.56$, $SD = 3.00$), while the parents (75 mothers, 13 fathers) were aged between 40.16 years to 63.26 ($M = 52.10$, $SD = 4.86$) years. Some participants

took part to gain course credits, while others volunteered after hearing about the study via posters and leaflets distributed at the university campus, and advertising at the university's student e-bulletin. The majority (84.70%) of the participants identified as white British. Two young adult participants involved in the present study also took part in Study 3 (see Chapter 4). Their IGQ variables measured at baseline (online) in Study 3 were used for the present study. All other participants were independent of those who took part in other studies. Fifty-three percent of participants were recruited by the candidate at the University of East Anglia. In addition, the candidate worked with two undergraduate students at the University of Reading who recruited the remaining 47% of participants.

Measures

Interpretation bias. The Interpretation Generation Questionnaire (IGQ; Dodd et al., 2015) (Refer to Appendix 8) consists of eight ambiguous scenarios that assess the generation, selection and anticipated emotional response to the ambiguous everyday situations. Half of the scenarios described social situations (e.g. You walk into a party and people turn to look at you, why?), while the other half described non-social situations (e.g. You're lying in bed at night when you hear a noise, what might it be?) to capture the range of situations typically encountered by young adults. Interpretation generation was measured by asking participants to imagine that the scenarios were happening to them, and to list all the explanations they could think of, up to a maximum of ten interpretations per scenario. Subsequently, anticipated emotional response was measured by asking participants to rate how they would feel if each of the interpretation they generated was actually happening to them, using a Likert scale ranging from -3 (very bad) to 3 (very good). Although the IGQ also measures interpretation selection (the interpretation participants thought was most likely to happen), this was not included in the present study as previous research found no significant association between interpretation selection and anxiety symptoms (Dodd et al., 2015).

Coding of IGQ responses. Each interpretation generated by participants was coded either as threat or non-threat. Interpretations were coded as ‘threatening’ if they suggested a threat-related outcome for the participant or reflected negative attributions to the self. Refer to Appendix 9 for the coding scheme of the IGQ. **Interpretation generation** was calculated as the proportion of interpretations that were threatening (total number of responses that were threatening divided by the total number of interpretations made). Additionally, **emotional response rating** was calculated as the average of participants’ emotional response ratings (sum of emotional response ratings divided by the total number of ratings made).

Two undergraduate researchers, who were blind to participant anxiety level as well as parent-child pairings, coded the interpretations generated. All interpretations were coded by both coders and an average score was used for the analyses. Inter-rater reliability for interpretation generation was $ICC(2, 2) = .89$. Internal consistency for interpretation generation and emotional response rating in the present sample were Cronbach’s alpha = .49 and .70 respectively. The Cronbach’s alpha values for the present sample are comparable to Dodd et al.’s (2015) study.

Trait anxiety symptoms. Young adults and parents completed the trait subscale (STAI-T) of the State-Trait Anxiety Inventory, Form Y-2 (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), which assesses trait anxiety symptoms in adults. The STAI-T is a 20-item self-report measure that assesses “relatively stable individual differences in anxiety proneness and refers to a general tendency to respond with anxiety to perceived threats in the environment” (Spielberger, Gorsuch and Lushene, 1970, p.3). The STAI has strong internal consistency and good test-retest reliability (Spielberger et al., 1983). Internal consistency for this sample was Cronbach’s alpha = .92.

Relationship closeness. Young adults completed the Unidimensional Relationship Closeness Scale (URCS; Dibble, Levine, & Park, 2012), a 12-item self-report measure that

assesses relational closeness. The URCS has strong internal consistency and good test-retest reliability. Internal consistency for this sample was Cronbach's alpha = .94. Participants also completed the Inclusion of Other in the Self Scale (IOS; Aron, Aron, & Smollan, 1992), which is a single-item measure assessing closeness using Venn-like diagrams to represent respondent's relationship with their partner. A relationship closeness score was calculated by averaging the IOS item along with the 12 URCS items, as recommended by Dibble et al. (2011).

Attachment to parent. Young adults completed the Inventory of Parent and Peer Attachment (IPPA; Armsden & Greenberg, 1987), a 25-item self-report measure which assesses young people's perception of how well parents and/or close friends serve as attachment figures. The IPPA produces a total security score, with higher scores reflecting higher attachment security. The IPPA has strong internal consistency and test-retest reliability. The parent version of the IPPA was used in this study and the internal consistency was Cronbach's alpha = .94.

Procedure

The School of Psychology Research Ethics Committee at the University of East Anglia and the School of Psychology and Clinical Language Sciences Research Ethics Committee at the University of Reading approved the methods of the study. Young adults who were interested in participating in the study was asked to invite the parent they identified as feeling 'closer' to. The participants then separately completed the measures outlined above in an online questionnaire. Both the young adults and their parents completed the IGQ and STAI-T, while the young adults completed the additional IPPA and relationship closeness measures. The participants were debriefed and then thanked for their time at the end of the questionnaire. Identical procedures were followed at both sites.

Results

Data Preparation

The IGQ yielded two continuous variables: interpretation generation and emotional response rating. Data for both variables from the IGQ was available for all participants, and for all the eight scenarios in the measure. Both the emotional response rating and STAI-T were positively skewed, while the IPPA was negatively skewed. All analyses involving these variables were bootstrapped, and estimates using 1000 bootstrapped samples were reported.

Preliminary Analyses

The demographic variables collected were age, gender and ethnicity. Preliminary analyses examined associations between these demographic variables and scores on the IGQ, STAI-T, STAI-S, IPPA and the relationship closeness variable for the young adult group and parent group separately. For young adults, age was significantly positively correlated with interpretation generation ($r = -.28, p = .01$) and emotional response rating ($r = .39, p < .001$); with increasing age, young adults made fewer threat interpretations and anticipated more positive emotions. Also for young adults, there was a significant gender difference in STAI-S, with women ($M = 38.29, SD = 10.57$) reporting higher state anxiety than men ($M = 31.82, SD = 4.67$), $t(34.54) = -3.50, p < .005, d = -1.19$. No other significant associations were found for either the young adult or parent groups. Interpretation generation and emotional response rating were significantly correlated with STAI-T in both young adults and parents respectively (see Table 1). Finally, to explore potential effects of gender on the intergenerational transmission of anxiety-related cognitions, the analyses below were first conducted by including all the participants in the sample, another by excluding the young adult men, and finally another by excluding fathers (because men and fathers were under-represented in the sample). Findings from all three sets of analyses were comparable, so analyses using the entire sample are presented.

Analyses

Table 1

Pearson's Correlations between Key Variables for Young Adults and their Parents

		Emotional Response	STAI-T	Closeness	IPPA
Young Adults	Generation	-.57**	.22*	0.15	0.07
	Emotional Response		-.43**	-.08	0.01
	STAI-T			-.09	-.36**
	Closeness				.76**
	IPPA				
Parents	Generation	-.57**	.21*	-	-
	Emotional Response		-.46**	-	-
	STAI-T				

* Are significant at $p < .05$. ** Are significant at $p < .01$.

Table 1 above shows the correlations between key variables for young adults and their parents separately. Bivariate correlations were run to examine whether young adults and their parents share similar interpretation biases (H1). As predicted, there was a significant moderate correlation between young adults' and their parents' negative interpretation generation, $r = .29$, $p = .01$. Likewise, the correlation between young adults' and their parents' emotional response rating was also significant, $r = .24$, $p = .03$. Next, a multiple regression was run to explore whether relationship closeness and attachment moderated the relationship between young adult and their parents' interpretation bias (H2). This analysis was first conducted with parent interpretation generation as a predictor variable and young adult interpretation generation as an outcome variable, followed by parent emotional response rating as a predictor variable and young adult emotional response rating as the outcome variable. These analyses were conducted using relationship closeness and then attachment as potential moderators separately, resulting in a total of 4 analyses. The results are presented in Table 2.

Table 2

Linear Model of Predictors for Young Adult's Interpretation Generation and Emotional Response

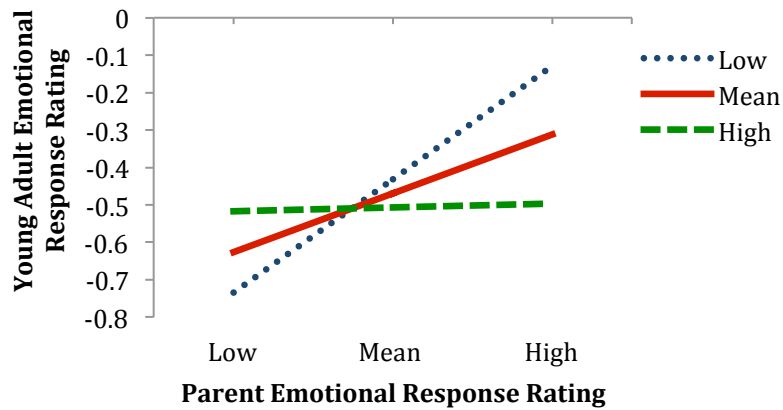
DV		R^2	b	$SE B$	t
Young Adult Generation	Constant	0.13	0.31	0.01	33.92**
	Parent Generation (centered)		0.28	0.08	3.46**
	Relationship Closeness (centered)		0.01	0.01	1.08
	Parent Generation x Relationship Closeness		-.10	0.06	-1.61
	Constant	0.12	0.31	0.01	33.45**
	Parent Generation (centered)		0.28	0.08	3.35**
	IPPA (centered)		<.001	<.001	0.34
	Parent Generation x IPPA		-.01	<.005	-1.45
Young Adult Emotional Response	Constant	0.15	-.47	0.06	-8.13**
	Parent Emotional Response (centered)		0.32	0.13	2.46*
	Relationship Closeness (centered)		-.04	0.07	-.53
	Parent Emotional Response x Relationship Closeness		-.28	0.14	-2.09*
	Constant	0.13	-.47	0.06	-8.04**
	Parent Emotional Response (centered)		0.33	0.13	2.5*
	IPPA (centered)		<.005	<.005	0.6
	Parent Emotional Response x IPPA		-.02	0.01	-1.94‡

* Significant at $p < .05$. ** Significant at $p < .01$. ‡ Approaching significance ($p < .07$).

Results showed that relationship closeness and attachment did not moderate the relationship between young adults and their parents' interpretation generation. However, relationship closeness was a significant moderator for the relationship between young adults' and their parents' emotional response rating. Simple slopes analyses showed that parent emotional response rating significantly predicted young adult emotional response rating when relationship closeness was low (-1 SD) and at the mean, $b = .62$, $t = 3.14$, $p < .005$ and $b = .32$, $t = 2.46$, $p = .02$ respectively, but not when relationship closeness was high (+1 SD), $b = .02$, $t = .12$, $p = .91$. Similarly, attachment security (IPPA score) seemed to moderate the relationship between young adult and parents' emotional response rating, although this relationship only approached significance. Parent emotional response rating significantly

predicted young adult emotional response rating when attachment security was low and at the mean, $b = .62, t = 2.58, p = .01$ and $b = .33, t = 2.50, p = .01$ respectively, but not when attachment was high, $b = .04, t = .28, p = .78$. The simple slopes equations are plotted in Figure 1.

A: Moderator = Relationship Closeness



B: Moderator = Parental Attachment

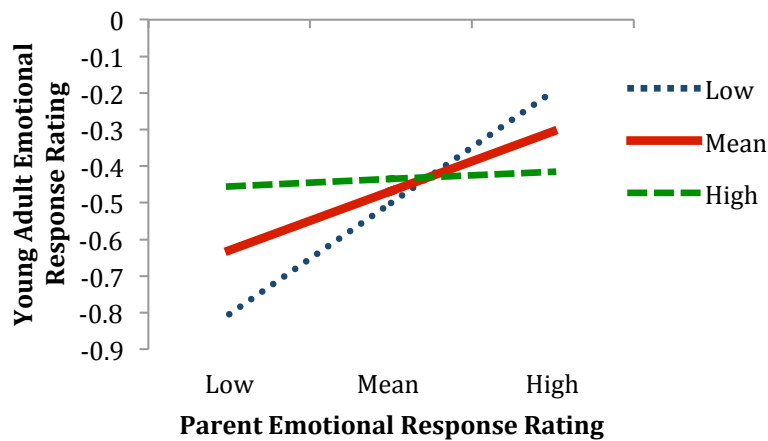


Figure 1. The moderating effects of relationship-specific factors on the relationship between parent and young adult emotional response ratings. **A** Moderator = Relationship closeness. **B** Moderator = Parental attachment.

Discussion

Research exploring the origins of anxiety-related cognitions indicates that parents may transmit their interpretation bias to their children (Drake & Ginsburg, 2012; Hadwin et al., 2006). However, research in this area has predominantly focussed on children in middle to late childhood, failing to consider whether parents continue to influence their children's anxiety-related cognitions in young adulthood. The present study aimed to fill this gap in the literature by examining the intergenerational transmission of interpretation bias in young adults and their parents.

The present study initially examined whether interpretation bias between parents and their young adult children were associated. Results supported the first hypothesis; there was a significant moderate correlation between young adults' and their parents' interpretation generation, as well as emotional response ratings. This finding is consistent with previous research on the intergenerational transmission of interpretation bias in children and adolescents (Bögels et al., 2003; Creswell & O'Connor, 2006; Creswell et al., 2005; Creswell et al., 2011), suggesting that parents still influence their children's anxiety-related cognitions even in young adulthood.

Next, we explored whether relationship-specific factors, namely relationship closeness and parental attachment security moderated the relationship between parents' and young adults' interpretation bias. The results were not consistent with the second hypothesis; relationship closeness and parental attachment only moderated the relationship between parents' and young adults' emotional response ratings, but not the relationship between their interpretation generation. Furthermore, contrary to our prediction, the relationship between parents' and young adults' emotional response ratings emerged only in people who reported low levels of relationship closeness or attachment security to their parents, but not in those who reported high closeness or attachment security. These results however, should be interpreted with caution as the moderating effect of parental

attachment only approached significance. These findings are inconsistent with the notion that young adults who are closer and have more secure attachments to their parents tend to communicate and seek advice from their parents more frequently and are therefore more likely to take on anxiety-related cognitions from their parents. One tentative explanation for this unexpected finding is that young adults who experience over-controlling parenting may report lower levels of closeness and attachment security to their parents and that this type of parenting may facilitate the transmission of anxiety-related cognitions. Over-controlling parenting, characterised by parents over-regulating their children's activities and routines and instructing them how to think or feel, may facilitate the intergenerational transmission of anxiety-related cognitions in two ways. First, these parents may be more likely to 'teach' their children to think in a certain way rather than allowing the child to develop their own opinions. Second, this type of parenting may restrict young adults from developing confidence in their ability to overcome challenges on their own (Affrunti & Ginsburg, 2012) and to develop autonomous thinking styles, making them reliant on their parents' advice or help. Consistent with this idea, research has shown that attachment security in adolescents (aged 14 – 18 years) has a curvilinear relationship with maternal dominance; securely attached adolescents tend to have a greater balance of maternal-adolescent assertiveness during a problem-solving task together, while insecurely attached adolescents tend to have more dominant mothers (Kobak, Cole, Ferenz-Gillies, Fleming, & Gamble, 1993). From an attachment perspective, the development of autonomy in adolescence has been compared with exploration in infancy. As attachment security enables a child to explore its environment, it also allows adolescents to develop autonomy (Grossmann, Grossmann, & Zimmermann, 1999). Therefore, it is plausible that young adults who reported higher attachment security and closeness to their parents in the present study possessed greater autonomy, which enabled them to explore and adopt anxiety-related cognitions that are different from their parents'. In contrast, those with lower attachment security and

closeness to their parents may have more dominant parents who might impose their own anxiety-related cognitions on their children, which undermines the young adults' autonomy to explore and adopt their own cognitions. Nevertheless, these interpretations are post-hoc and speculative; this unexpected finding requires further replication.

In the present study, we adopted the IGQ (Dodd et al., 2015) that distinguished between different phases in the processing of ambiguous stimuli: interpretation generation and emotional response. The IGQ allows for the generation of multiple interpretations to ambiguous situations, which is a more accurate reflection of the process of interpretation, as recent research has demonstrated that children as young as six years were able to generate alternative interpretations to ambiguous situations (Berry & Cooper, 2012). Moreover, research has shown that anticipated negative emotion in response to ambiguous scenarios is associated with anxiety (Creswell & O'Connor, 2011; Creswell et al., 2011; Dodd et al., 2015), highlighting the importance of considering children's emotional response to ambiguity, alongside their interpretations in understanding the nature of anxiety. In the present study, the correlation between emotional response and anxiety was substantially stronger than the association between interpretation generation and anxiety, indicating that emotional response may be more important than interpretation generation in predicting anxiety. This is consistent with previous research showing that children's emotional response, but not their threat interpretation, predicted change in anxiety over time (Creswell et al., 2011). Conceivably, young adults' emotional response could be a more relevant target for modification in prevention and treatment efforts in the future.

The results of the present study should be interpreted with several limitations in mind. Young adult men and fathers were underrepresented in the present sample. Although preliminary analyses showed that excluding young adult men and fathers did not substantially alter the results of the study, indicating that the pattern of results for these participants was unlikely to be hugely deviant from the results reported, further research

with fathers is required in this field (Bögels & Phares, 2008). Moreover, the significant associations may not necessarily implicate a causal link. Future research could examine the causal relationship of this intergenerational transmission by adopting a longitudinal design, or exploring whether young adults' anxiety-related cognitions change following a discussion with their parents. Finally, in line with research suggesting the bi-directionality of effects in parenting behaviours and childhood anxiety (Hudson, Doyle, & Gar, 2009; Murray, Creswell, & Cooper, 2009), it is also important to recognize the possibility of a reciprocal relationship in the intergenerational transmission of anxiety-related cognitions. That is, instead of a direct causal effect of parents on their children's bias, young adults could also influence their parents' bias.

Conclusion

Overall the findings demonstrate that parents may influence children's anxiety-related cognitions even in early adulthood. Young adults' interpretation bias and emotional response to ambiguity was associated with their parents' bias and emotional response respectively. The latter relationship was influenced by young adults' perceived closeness and attachment security to their parents. This suggests that parents are still an important consideration in the development and/or maintenance of anxiety and anxiety-related cognitions even in young adulthood.

Chapter 6: General Discussion

The research conducted for this thesis aimed to explore whether anxiety-related cognitions, specifically interpretation bias and fear beliefs, might be learned from significant others within close relationships (i.e., parents, friends and romantic partners). It also considered a range of developmental stages to identify potential sources of influence that may play a role in the acquisition and/or maintenance of information processing bias across development. The thesis aims were realised across four studies that explore shared anxiety-related cognitions (interpretation bias or fear beliefs) in distinct close relationships. This chapter begins with an overview of the findings of each study, followed by an outline of the findings according to the two overarching hypotheses: 1) shared cognition in close relationships, and 2) the transmission of anxiety-related cognitions in close relationships. Next, this chapter will discuss two additional themes from across the studies, which are: 1) moderators of shared cognition, and 2) the association between anxiety-related cognitions and anxiety. Then, some limitations from the studies and the recommendations for future directions are discussed. Finally, some clinical implications from the findings will be introduced, and the chapter ends with a summary of the take home messages from this body of work.

6.1 Overview of Findings

6.1.1 *Study 1: Shared Cognition in Childhood Anxiety: Interpretation Bias in Preschool*

Children and Their Parents

Field and Lester (2010) suggest that early childhood may be a crucial period for acquiring an interpretation bias. In exploring how this bias might develop, Study 1 examined the intergenerational transmission of interpretation bias from parents to their preschool-aged children via the verbal information pathway. Parents reported on their own trait anxiety and interpretation bias, their child's anxiety symptoms, and completed a written story-stem measure, which aimed to capture the way parents tell their children stories.

Interpretation bias in young children was assessed using the story-stem paradigm, whereby ambiguous story-stems were completed using dolls and props. The results showed that young children's interpretation bias was not significantly associated with their trait anxiety. There was also no evidence for a significant association between parent and child interpretation bias, or between parent trait anxiety and the number of stories parents completed in a threatening manner. However, children's interpretation bias was significantly associated with parents' written stories, and there was some indication that this effect was stronger for younger children, compared to older children. Overall, the findings supported the notion that parental verbal information via storytelling could play a role in the development of interpretation bias in young children.

6.1.2 Study 2: The Effects of Peer Discussion: Do Close Friends Influence Each Other's Fearfulness

Extending findings from Study 1, this study explored whether anxiety-related cognitions in children might also be transmitted in other forms of close relationships, apart from the parent-child relationship. As peers become an increasingly influential source of information to children in middle childhood (Schunk, 1987), Study 2 examined whether primary school-aged children might acquire anxiety-related cognitions from their close friends. The children were first presented with ambiguous and threatening information about novel animals, before their fear responses (fear beliefs and avoidance behaviours) for each animal were measured. Next, pairs of close friends discussed their fear beliefs and avoidance, after which their fear responses were measured again. Results showed that close friends shared similar fear responses even before the discussion, and these became more similar following the discussion. Furthermore, gender pair type predicted change in children's fear responses over time; only those in boy-boy pairs became significantly more fearful and avoidant after the discussion. The observed increase in fearfulness in boy-boy pairs appeared to be driven by their low levels of fear responses at baseline as their fearfulness post

discussion was comparable to other children in the sample. Based on this finding, it was argued that the observed '*fear accentuating effect*' in boy-boy pairs may be the result of boys under-reporting their fearfulness at baseline. Finally, the difference in anxiety levels between close friends did not predict how children's fear responses changed following the discussion. Overall, there is some evidence that children influence each other's anxiety-related cognitions, as their fear responses became more alike following the discussion, but there is no convincing evidence that they accentuated each other's fear responses.

6.1.3 Study 3: Do Romantic Partners Affect Each Other's Cognition?

Young adulthood is a developmental stage that has been implicated as a risk period for the onset of anxiety disorders (Newman et al., 1996). Following on from Study 2, this study aimed to explore whether young adult couples might affect each others' anxiety-related cognitions. Young adults first completed an interpretation bias measure on their own, which consisted of eight ambiguous scenarios. They then discussed their responses to half of the scenarios used in the interpretation bias measure with each other, before completing the interpretation bias measure again separately. Results showed that couples' interpretation bias did not become more similar following the discussion. However, their interpretation bias generally decreased after the discussion. Specifically, all young adults generated interpretations that were less threatening after the discussion. For their emotional response, those in the younger age group (18.78 – 21.49 years old) anticipated feeling less negative if the scenarios were to occur to them following the discussion. In contrast, there was no significant change in negative emotionality in the older age group (21.50 – 31.48 years old). Moreover, change in couples' interpretation bias was not moderated by the difference in anxiety levels between partners, relationship closeness or attachment anxiety. Overall, the findings showed that young adult couples do influence each other's interpretation bias, plausibly through the co-regulation of emotions during the discussion, but that they do not share similar patterns of cognitions.

6.1.4 Study 4: Shared Cognition in Anxiety: Interpretation Bias in Young Adults and their Parents

Evidence suggests that parents influence their children even in young adulthood. Extending work from Study 1, the present study investigated whether young adults and their parents share similar interpretation bias. Young adults and their parents completed the interpretation bias measure separately, using an online questionnaire. Results showed that parent-child interpretation generations and emotional response ratings were significantly correlated. Additionally, young adults' perceived closeness and attachment security to their parents moderated the relationship between parent-child emotional response ratings, but not the relationship between their interpretation generations. Contrary to our prediction, the association between parent-child emotional responses was significant only in those who reported low levels of closeness and attachment security to their parents. Nevertheless, the findings indicate that parents remain important when considering the onset and/or maintenance of anxiety-related cognitions in young adults.

6.2 Integration of Findings

6.2.1 Shared Cognition in Close Relationships

With a view to understanding how anxiety-related cognitions develop, existing literature on shared cognition predominantly focuses on the parent-child relationship in middle to late childhood (e.g., Bögels, van Dongen, & Muris, 2003; Creswell, Shildrick, & Field, 2011). The studies in this thesis aimed to extend research in this area by exploring shared cognitions in different forms of close relationships (parent-child, friendships, romantic relationships) across development (early and middle childhood, and young adulthood) to identify potential sources of influence that may affect the development and/or maintenance of anxiety-related cognitions in children and young people.

As stated in Section 1.9.2, the first overarching hypothesis of this thesis was that interpretation bias/fear responses in individuals in close relationships will be significantly correlated. Overall, there is some support for this hypothesis but it is not consistent across the four studies. In terms of the parent-child relationship, Study 1 showed no evidence for shared patterns of interpretation bias between parents and their preschool-aged children, which contradicts previous research on the intergenerational transmission of anxiety-related cognitions (Bögels et al., 2003; Creswell & O'Connor, 2006; Creswell, Schniering, & Rapee, 2005; Creswell et al., 2011) but is consistent with other work that has failed to find an association (Creswell, O'Connor, & Brewin, 2006; Gifford, Reynolds, Bell, & Wilson, 2008). In contrast, findings from Study 4 supported the intergenerational transmission hypothesis, showing a significant association between parents' and their young adult children's interpretation bias. As this study adopted a cross-sectional design, it is unclear when this association between parent and child bias was first present or the extent to which children and parents might affect each other reciprocally. It is possible that the association between parent and child bias emerged relatively early in life and is maintained into young adulthood. Alternatively, the bias may have been acquired in young adulthood. Haefel and Hames (2014) argue that cognitive biases are susceptible to influence during life transitions, when individuals experience sustained exposure to novel social contexts, such as moving to university. As young adults begin to share similar life experiences with their parents at this developmental stage (Bengtson & Black, 1973), they may be more likely to seek help and advice from their parents, which may provide a context within which parent and child cognitive styles become more similar. However, considering that parent-child interactions tend to remain relatively stable over time (Aquilino, 1997; Rossi & Rossi, 1990; Whitbeck, Hoyt, & Huck, 1994), and that there is some evidence that parents and children share similar patterns of anxiety-related cognitions in childhood (Bögels et al., 2003; Creswell & O'Connor, 2006; Creswell et al., 2005; Creswell et al., 2011), it seems likely that the observed

association in parent-child bias in Study 4 was present before young adulthood. If this inference is correct, prevention or treatment efforts could emphasize targeting parents' bias, as they might play an enduring role in the development and/or maintenance of their children's bias. That said, it is important to acknowledge that the effect sizes found for the associations between parent and child bias in Study 4 were fairly modest ($r_s = .24 - .29$), therefore caution should be given when interpreting the results for future implications.

In addition, the findings regarding shared cognition in other forms of close relationships are also mixed. Study 2 provided convincing evidence that close friends in middle childhood share similar patterns of fear responses (fear beliefs and avoidance behaviours) to novel animals, indicating that anxiety-related cognitions may be transmitted within close friendships. However, Study 3 showed no evidence that young adult romantic partners share similar patterns of interpretation bias to one another. Although this finding seems to contradict Haefel and Hames' (2014) argument that cognitive biases are susceptible to influence in young adulthood, perhaps romantic partners who meet each other as young adults have not been in the relationship long enough to exert sustained influence that may necessitate shared patterns of anxiety-related cognitions.

As a whole, results from these studies partially support the first overarching hypothesis in this thesis, suggesting that individuals in close relationships do share similar anxiety-related cognitions. The findings extend existing knowledge, suggesting that anxiety-related cognitions may be transmitted in different forms of close relationships across developmental phases. More specifically, the findings showed that close friends in middle childhood, as well as young adults and their parents share similar fear responses/interpretation biases as each other, indicating that these individuals may play a role in affecting the acquisition and/or maintenance of anxiety-related cognitions.

There are several limitations relating to the findings of shared cognition, and the results discussed above should be interpreted with these in mind. First, fathers and young

adult men were underrepresented in Studies 1 and 4. As the parents in Study 1 comprised largely of mothers, it was not possible to ascertain whether fathers' interpretation bias is associated with their children's interpretation bias. Future research should therefore focus on greater inclusion of fathers, to clarify whether fathers play a similar role as mothers in influencing their young children's anxiety-related cognitions. In addition to the underrepresentation of fathers, the participants in Study 4 were mainly women. Although the results of the study remained comparable when fathers and young adult men were excluded from the analyses, the findings mainly reflect the association between young adult women and their mothers' interpretation bias. However, it should be highlighted that the young adult participants were asked to invite the parent they felt closest to to participate in the study with them, thus this over-representation of mothers reflects reality, rather than being a result of sampling bias. Further, it could be argued that the association between parent and child cognitions is likely stronger within this dyad than between the child and their other parent. Nevertheless, future work including young adult males and fathers would allow a clearer understanding of how anxiety-related cognitions are transmitted across genders in both generations. Furthermore, this thesis focused on anxiety-related cognitions within community samples. As such, it remains possible that different patterns of shared cognitions might be found in clinical samples. Work of this nature would be particularly useful for informing treatment efforts regarding the potential utility of targeting the transmission of maladaptive cognitions within close relationships.

6.2.2 Transmission of Anxiety-related Cognitions in Close Relationships

The second overarching hypothesis of this thesis was that individuals in close relationships would influence each other's anxiety-related cognitions. Similar to research in shared cognition, existing literature examining the effect of discussion and the verbal information pathway more specifically, has predominantly focused on the parent-child relationship in middle to late childhood (Barrett, Rapee, Dadds, & Ryan, 1996; Chorpita &

Albano, 1996; Dadds, Barrett, Rapee, & Ryan, 1996; Field, Lester, & Cartwright-Hatton, 2008; Muris, van Zwol, Huijding, & Mayer, 2010). The studies in this thesis therefore aimed to extend existing research by investigating whether anxiety-related cognitions might be transmitted within a variety of close relationships, with the goal of gaining a better understanding of how such cognitions are acquired and/or maintained in children and young people.

There is concordant evidence across Studies 1-3 in this thesis to support the second hypothesis; note this was not examined in Study 4. To begin with, Study 1 showed that parent written stories, which captured the way in which parents tell their children stories, was significantly associated with their preschool child's interpretation bias. This finding showed for the first time that young children might acquire an interpretation bias from the way their parents communicate to them. However, it is important to note that this result was found in the context of no association between parent and child interpretation bias. This suggests that young children might initially acquire an interpretation bias from their parents' verbal information, and the association between parent and child bias only emerges when children's bias are more developed later in childhood. This supports Field and Lester's (2010) proposition that interpretation biases are acquired in early childhood, and suggests that early intervention targeting parental verbal information could be effective in preventing the development of maladaptive cognitions in at-risk populations.

Furthermore, Studies 2 and 3 also indicated that close friends in middle childhood and romantic couples influence each other's anxiety-related cognitions following a discussion. For instance, fear responses (fear beliefs and avoidance behaviours) towards novel animals in close friends became significantly more similar after they had a discussion about fear-related issues with each other. Further evidence indicated that children in boy-boy pairs (but not in girl-girl or boy-girl pairs) generally became more fearful and avoidant of the novel animals after the discussion. Assuming that verbal information regarding their

fears was exchanged during the discussion, this finding suggests that those children may have accentuated each other's fears via verbal information transfer. However, given that this fear accentuating effect in boy-boy pairs was mainly driven by their low levels of fear responses at baseline, as their fear responses were comparable to children in other gender pair types at post-discussion, this finding should be interpreted with caution. Nevertheless, findings from this study indicate that close friends in middle childhood may transmit anxiety-related cognitions to each other possibly via the transfer of verbal information during the discussion. Finally, although there was no evidence that young adult couples' interpretation bias became significantly more similar following a discussion on ambiguous scenarios, their interpretation bias generally decreased after the discussion. That is, following the discussion, they generated fewer threatening interpretations and reported anticipating less negative emotions if the scenarios were to occur to them, suggesting that young adult couples influence each other's interpretation bias during the discussion. Given the broad effect of the discussion on cognitions here, it is not clear whether the exchange of verbal information played a role in this change in cognitions from pre to post-discussion. There are several alternative explanations, including that the couple engaged in co-regulation of each others' emotions during the discussion and that the interaction itself, rather than the content of the discussion, led to a decrease in state anxiety, which affected cognitions.

Overall, there is convincing evidence from these studies to support the second overarching hypothesis: that individuals in close relationships will influence each other's cognitions. In particular, verbal information transfer may be a pathway through which anxiety-related cognitions are transmitted from parents to their young children, as well as between close friends in middle childhood and romantic couples in young adulthood but further research is required to establish whether this is the primary pathway of influence.

There are some limitations to the work relevant to the second hypothesis as well. First, as mentioned in the previous section, fathers were underrepresented in Study 1.

Therefore, it was not possible to ascertain whether fathers' verbal information, as captured using the written stories also influence their young children's interpretation bias, even though it is likely that both parents play a role in influencing their children's bias. Ideally, future work should adopt a design that involves both parents to examine whether influence from each parent has an additive effect on their child's interpretation bias. In other words, are children at a greater risk of developing an interpretation bias if both parents communicated in a threatening manner to them, compared to if only one parent did so? This could inform prevention efforts regarding whether targeting both parents' verbal information is needed to intercept the intergenerational transmission of interpretation bias, or whether focusing on mothers/the parent who spends the most time with the child/the parent the child perceives themselves to be closest to is sufficient.

6.2.3 Moderators of Shared Cognition: Differences in Anxiety Levels and Relationship

Factors

As mentioned in the section above, there is reasonable evidence suggesting that anxiety-related cognitions may be shared within close relationships but findings are somewhat inconsistent, both in the present research and existing research. In line with this, two studies in this thesis also explored potential moderators of the association between two individuals' cognitions. First, Studies 2 and 3 examined whether differences in anxiety levels between individuals in close relationships would moderate the transmission of such cognitions. That is, these studies examined whether individuals with higher levels of anxiety might have a negative effect on their less anxious partners' anxiety-related cognitions, or whether individuals with lower anxiety might attenuate their more anxious partners' anxiety-related cognitions. Therefore, they may persuade their less anxious partners to adopt a more threatening bias, or adjust their own interpretations to become less threatening. Study 2 explored whether differences in anxiety levels between close friends moderated the change in their fear responses towards novel animals following the

discussion. Similarly, Study 3 investigated whether differences in anxiety levels between young adult couples moderated the change in their interpretation bias after the discussion. As a whole, there was no evidence that differences in anxiety levels between individuals in close relationships moderated the transmission of anxiety-related cognitions. This suggests that any change in anxiety-related cognitions following the discussion was not driven by how discrepant the anxiety scores were between individuals in the relationship, and the participants were equally affected by the discussion regardless of whether they were more or less anxious compared to their friend or partner. This finding is important because it indicates that having a romantic partner or close friend who is more anxious may not necessarily have a negative impact on an individual's own anxiety-related cognitions. However, it also suggests that having a partner or friend who is less anxious does not attenuate the anxiety-related cognitions in individuals who are more anxious. Nonetheless, this finding may be limited to non-clinical samples, as both Studies 2 and 3 involved participants from community samples. This null finding could be attributed to the limited range of anxiety scores in community samples. Increasing the diversity of the anxiety scores by including clinically anxious participants could perhaps yield a different result, as the difference in anxiety levels between individuals in the relationships could be substantially larger.

Furthermore, Studies 3 and 4 also examined whether relationship factors, such as relationship closeness and attachment, moderate the transmission of interpretation bias in close relationships. Van Orden and Joiner (2006) indicated that relationship closeness might be a potential moderator in the transmission of negative affect between married couples. As couples high in closeness tend to share their thoughts and feelings more frequently with each other (Robinson & Blanton, 1993), it is plausible that they might transmit their affect or cognitions to each other when they communicate. In addition, research indicates that romantic attachment anxiety is positively associated with help seeking behaviours (Vogel &

Wei, 2005). As adults tend to use their romantic partners as a secure base at times of stress (Hazan & Shaver, 1987), those with high attachment anxiety may be more likely to seek help and advice from their partners at times of uncertainty, which may allow for the transmission of anxiety-related cognitions between partners. Results from Study 3 showed that relationship closeness and romantic attachment anxiety did not influence the extent to which young adult couples influenced each other's interpretation bias during the discussion. It is plausible that the moderating effect of relationship closeness may be limited to emotional symptoms but not participants' cognitions. It is important to consider however that the discussion did not induce an emotional/stressful event that would activate young adults' help-seeking behaviours, thus the moderating effect of romantic attachment anxiety may not manifest in this context. Alternatively, these moderating effects may take place over a longer period of time rather than during a brief lab-based discussion.

Moreover, evidence suggests that young adults who report feeling closer to their parents tend to communicate more frequently with them after moving away for university (Sullivan & Sullivan, 1980). Therefore, it is plausible that relationship closeness may facilitate the transmission of anxiety-related cognitions between young adults and their parents as they tend to share their thoughts and feelings more frequently with each other. Research also shows that young adults who are more securely attached to their parents tend to seek help and advice from them at times of stress (Kenny, 1987), which may also allow for the transmission of anxiety-related cognitions from parents to their young adult children. Study 4 showed that relationship closeness and parental attachment only moderated the association between parents' and young adults' emotional response ratings, but not the association between their interpretation generations. Furthermore, this association between their emotional response ratings emerged only in young adults who reported low levels of relationship closeness or attachment security to their parents, but not in those who reported high closeness or attachment security. This finding is inconsistent with the

predictions of the study, and requires further replication as it is unclear why low levels of these relationship factors would moderate the relationship between parent-child emotional responses. It is speculated that perhaps young adults who experience over-controlling parenting may report lower levels of closeness and attachment security to their parents and that this type of parenting may facilitate the transmission of anxiety-related cognitions in two ways. First, over-controlling parents may be more likely to 'teach' their children to think in a certain way rather than allowing the child to develop their own opinions. Furthermore, this type of parenting may restrict young adults from developing confidence in their ability to overcome challenges on their own (Affrunti & Ginsburg, 2012) and to develop autonomous thinking styles, making them reliant on their parents' advice or help. Overall however, there is no convincing evidence to suggest that relationships factors, specifically relationship closeness and attachment, facilitate the transmission of anxiety-related cognitions in close relationships.

6.2.4 Associations between Anxiety-related Cognitions and Anxiety, and Developmental Considerations

Research has found interpretation bias to be positively associated with anxiety in children, although the evidence has not been completely consistent (e.g., Hadwin, Frost, French, & Richards, 1997; Taghavi, Moradi, Neshat-Doost, Yule, & Dalgleish, 2000; Barrett, Rapee, Dadds, & Ryan, 1996; Chorpita & Albano, 1996; Creswell & O'Connor, 2006; Dodd, Hudson, Morris, & Wise, 2012; Dodd, Stuijtzand, Morris & Hudson, 2015, Creswell, Murray, & Cooper, 2014). In this thesis, this relationship between anxiety-related cognitions and anxiety was found in Studies 2-4, but not in Study 1. More specifically, fear responses (fear beliefs and avoidance behaviours) were significantly correlated with anxiety symptoms in middle childhood (aged 7-10 years), and interpretation bias was significantly correlated with trait anxiety in young adulthood (aged 17 – 32 years). However, interpretation bias was not significantly associated with anxiety symptoms in preschool-aged children (aged 2 years 7

months to 5 years 8 months). These findings support Field and Lester's (2010) acquisition model of information processing which suggests that biases may not be present or fully developed in early childhood, as certain cognitive, emotional and social skills may be necessary to acquire these biases (Field & Lester, 2010). Based on the findings mentioned above, it is likely that interpretation bias that initially develops during preschool years may not begin to show an association with normal individual differences in anxiety until middle childhood. Note that Dodd and colleagues (2012) found that this bias was significantly associated with clinical anxiety diagnoses in preschool-aged children. Thus, an association between bias and clinical levels of anxiety may be present earlier. If this was true, interventions focusing on bias modification could target clinically anxious young children in efforts to reduce their threat bias.

6.3 Limitations and Future Directions

This section will discuss some of the limitations from the studies in this thesis, which will in turn form the basis for recommendations for future work. First, as shared cognition within close relationships was examined cross-sectionally, causality could not be inferred, although the discussion task in Studies 2 and 3 did provide some evidence that individuals in close relationships do influence each other's anxiety-related cognitions. Thus far, little research has explored the longitudinal nature of shared cognition, and existing studies have only focused on the parent-child relationship in middle childhood (Creswell, O'Connor, & Brewin, 2006; Creswell et al., 2011). As it is likely that children's interpretation bias begin to form in early childhood (Field and Lester, 2010), a longitudinal design could determine whether parents' bias predicts their children's bias over time as they transition from early to middle childhood, to demonstrate clearly the intergenerational transmission of maladaptive cognitions early on in children's lives. This methodology will also allow for a better understanding of the relative influence of close relationships across developmental stages, if multiple influences (e.g. parents and peers) are examined at each timepoint. This will enable

prevention and treatment interventions to target the relevant relationship that is exerting a dominant influence on children and young people at a particular developmental stage. For instance, if longitudinal research revealed that close friends show increasing influence on each other's anxiety-related cognitions as they transition from middle childhood to adolescence, interventions could yield a more promising outcome if they target the influence of close friendships in adolescence instead of in middle childhood. Likewise, a longitudinal design could reveal that targeting the influence of romantic partners would be more effective in older adults, as longer term couples may exert a stronger influence on each other's anxiety-related cognitions than couples in young adulthood. Finally, a longitudinal method whereby anxiety and bias are measured at repeated intervals over time will also be able to inform discussion and theory on whether anxiety interacts with development to cause an interpretation bias, or whether anxiety is a consequence of acquiring the bias (Field & Lester, 2010).

Also, although Studies 1 and 4 showed that parental verbal information (measured using written stories) and parental interpretation bias predicted children's interpretation bias respectively, these studies assumed that parents have a direct influence on their children's bias. However, research suggests that parent-child interactions involve the bi-directionality of influence (Grusec & Davidov, 2007). It is plausible that young children's anxiety may influence their parents' verbal information, and that young adult children's anxiety or interpretation bias may in turn influence their parents' bias. Therefore, adopting a longitudinal design would allow for such reciprocal effects to be examined. Moreover, using an innovative experimental design, Hudson, Doyle and Gar (2009) observed mothers interacting with clinically anxious or non-anxious children who were not their own during a speech preparation task. The authors found that mothers showed greater involvement with clinically anxious children, compared to non-anxious children, regardless of the clinical status of their own children. This suggests that children's anxious behaviours may influence

parents' overinvolvement, evidence for the reciprocal relationship between child anxiety and parenting behaviours. Future research could therefore adopt a similar experimental design by asking parents to co-operatively complete story-stems with unrelated young children, or discuss ambiguous scenarios with unrelated young adults to investigate the reciprocity of influence between parents and children.

Finally, by adopting the discussion task, Studies 2 and 3 were able to demonstrate how individuals in close relationships influence each other's anxiety-related cognitions when they communicate with each other. Future research could extend this work by experimentally manipulating the valence of verbal information that is passed on from one individual to another in a close relationship. For instance, using a similar principle to cognitive bias modification research (e.g., Mathews, Ridgeway, Cook, & Yiend, 2007; Wilson, MacLeod, Mathews, & Rutherford, 2006), young adult romantic couples could be assigned to either the participant or confederate role, with the confederate asked to interpret ambiguous scenarios in either a threatening or non-threatening manner (according to a predetermined script) during the discussion. This methodology would demonstrate whether young adults might acquire anxiety-related cognitions from their romantic partners specifically via the transfer of negative verbal information. More importantly, this methodology would lead directly to clinical implications; if couples were able to decrease one another's threat interpretations within this paradigm it could be used as a way of modifying bias. It is worth noting that Study 1 initially piloted an experimental design similar to that mentioned above, whereby parent-child pairs from a community sample were assigned to either the 'positive parental stories' condition or the test-retest control condition. In the positive stories condition, parents were asked to verbally complete four ambiguous story-stems in a positive manner to their children (according to a script given by the researcher), and young children's interpretation bias was measured using eight ambiguous story-stems before and after the parents told them the positive stories. The pilot

study found that the children could not attend to the task for long enough to complete all the three phases (baseline, positive manipulation, and post-test) in a single session. Moreover, as children's interpretation bias was relatively low even at baseline there wasn't scope for this to significantly decrease as a function of parent stories. Therefore, future research could consider spreading the phases across several short sessions/days to ensure that young children remain engaged in the task, and include children from highly anxious or clinically anxious samples.

6.4 Clinical Implications

Even though this thesis found some evidence that anxiety-related cognitions are shared and affected by discussions within close-relationships, and that verbal information transfer appears to be one of the pathways of transmission, the effect sizes of these associations/effects are fairly modest and the evidence across the four studies are somewhat inconsistent. Therefore, it is not entirely convincing that modifying the interpretation bias of a significant other or preventing the transmission of the bias within close relationships would be a worthwhile approach to treatment. As such, more research is needed to examine and clarify this further.

Recently, research has demonstrated potential clinical implications for the use of parent-administered cognitive bias modification of interpretations (CBM-I) training in children (aged 7-11 years) through story-telling (Lau, Pettit & Creswell, 2013). Parents read a total of 45 bedtime stories across 3 consecutive evenings, exposing their children to benign resolutions of ambiguous social situations. Results indicated that children who received the training exhibited greater reductions in threat interpretation and social anxiety symptoms post-training, compared to the test-retest control group. Using a similar methodology, future research could extend Study 1 by asking parents to tell non-threatening stories to their highly anxious or clinically anxious young children using the story-stem paradigm, as

discussed above. If children's interpretation bias and/or anxiety decrease following the non-threat 'training', it would provide convincing evidence that parents' verbal information can influence their young children's bias. In turn, early intervention could adopt the story-stem paradigm as means of modifying maladaptive cognitions in at-risk or anxious young children through positive parental story telling.

Furthermore, as mentioned in Section 6.3, future research could use the cognitive bias modification methodology (e.g., Mathews, Ridgeway, Cook, & Yiend, 2007; Wilson, MacLeod, Mathews, & Rutherford, 2006) and ask significant others to discuss ambiguous situations in a non-threatening manner with the participants. If this non-threat CBM training from significant others is effective in decreasing participants' interpretation bias, prevention interventions could adopt this methodology by encouraging at-risk or anxious individuals to explicitly discuss ambiguous situations in a non-threatening manner with people they share a close relationship. For instance, school-based interventions aiming to reduce anxiety in primary school-aged children could instruct pairs of close friends to discuss and resolve their worries in a positive manner with each other.

Finally, further research could also directly examine whether modifying the interpretation bias of a significant other and/or preventing the transmission of the bias improves the efficacy of treatment interventions. Research of this nature could reveal for instance, whether including parents in cognitive behavioural therapy (CBT) with their children to target parents' interpretation bias and/or verbal information could yield a better therapeutic outcome, compared to the stand-alone CBT for children. Likewise, even with young adults, it could indicate whether including romantic partners or parents in CBT would be more beneficial than if the young adults underwent CBT on their own.

6.5 Conclusions

Taken together, findings from the four studies provide some support for the overarching hypotheses in this thesis, showing that (1) individuals in close relationships do share similar patterns of anxiety-related cognitions, and that (2) they do influence each other's anxiety-related cognitions via the transfer of verbal information or discussion. This thesis extends existing knowledge, demonstrating for the first time that anxiety-related cognitions might be transmitted within close relationships across various developmental stages, and that verbal information transfer appears to be one of the viable pathways in which such cognitions are transmitted. The main findings of this thesis are summarized below.

- There is some evidence that individuals in close relationships share similar patterns of anxiety-related cognitions, namely close friends in middle childhood, as well as young adults and their parents, indicating that individuals in these relationships may play a role in influencing the acquisition and/or maintenance of each others' anxiety-related cognitions.
- There is also some indication that anxiety-related cognitions are transmitted via the verbal information pathway in different forms of close relationships, such as from parents to their young children, between close friends in middle childhood, as well as between romantic partners in young adulthood.
- Results also showed that factors such as the difference in anxiety levels between individuals in close relationships, relationship closeness, and attachment do not appear to moderate the transmission of anxiety-related cognitions in close relationships.
- Finally, consistent with Field and Lester's (2010) acquisition model of information processing, results showed a significant association between anxiety-related cognitions and anxiety in middle childhood and young adulthood, but not in early

childhood, indicating that interpretation bias may initially develop during preschool years and may not show an association with anxiety until middle childhood.

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Appendix 1

Published Article for Chapter 2

Shared Cognition in Childhood Anxiety: Interpretation Bias in Preschool Children and Their Parents

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Abstract Although interpretation bias has been associated with the development and/or maintenance of childhood anxiety, its origins remain unclear. The present study is the first to examine intergenerational transmission of this bias from parents to their preschool-aged children via the verbal information pathway. A community sample of fifty parent–child pairs was recruited. Parents completed measures of their own trait anxiety and interpretation bias, their child’s anxiety symptoms, and a written story-stem measure, to capture the way parents tell their children stories. Interpretation bias was assessed in preschool-aged children (aged between 2 years 7 months and 5 years 8 months) using an extended story-stem paradigm. Young children’s interpretation bias was not significantly associated with their own anxiety symptoms. Neither was there evidence for a significant association between parent and child interpretation bias. However, parents who reported they would tell their child one or more threatening story endings in the written story-stem task had significantly higher anxiety than those who did not include any threatening story endings. In turn, children whose parents did not include any threatening endings in their written stories had significantly lower threat interpretations on the child story-stem paradigm, compared to those with parents who included at least one threatening story ending. The results suggest that parental verbal information could play a role in the development of interpretation bias in young children.

Keywords Interpretation bias · Anxiety · Cognition · Children · Parents

Introduction

Childhood anxiety disorders are the most prevalent psychological disorders in preadolescent children, with approximately 3–5 % of children younger than 12 years meeting criteria for an anxiety disorder at any given time (Cartwright-Hatton et al. 2006). A recent review (Simon et al. 2014) suggested that anxiety in preadolescent children has a negative impact on quality of life, predicting subsequent social and scholastic incompetence in adolescence (Bosquet and Egeland 2006), non-completion of schooling (Duchesne et al. 2008), and lower adaptive functioning (Ialongo et al. 1995). In addition, evidence also suggests that anxiety in early childhood is a major risk factor for subsequent anxiety, as well as other mental health problems later in life, such as aggression (Dallaire and Weinraub 2007), affective disorders (Clark et al. 2007), and oppositional-defiant disorder (Bufferd et al. 2012). Young children’s anxiety problems tend to persist in the absence of any intervention and early treatment is therefore crucial (Simon et al. 2014).

In exploring the origins of childhood anxiety, previous research has shown that anxious parents are more likely to have an anxious child than non-anxious parents (Mancini et al. 1996; Weissman et al. 1984). About one-third of this relationship is accounted for by genetics (Gregory and Eley 2007), leaving a significant role for the environmental effects of having an anxious parent (Creswell et al. 2010; Hadwin et al. 2006). One way in which parental anxiety might have an environmental effect on children’s anxiety is via the intergenerational transmission of biased thinking

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styles. Interpretation bias refers to a tendency to disproportionately interpret ambiguous situations as threatening (Field et al. 2011; Hadwin et al. 2006). This bias may play a role in the onset, and/or maintenance of childhood anxiety disorders (Creswell and O'Connor 2011; Dodd et al. 2012; Vassilopoulos et al. 2009; Warren et al. 2000), and it has been hypothesised that anxious parents may inadvertently transfer their interpretation bias to their child via verbal communication (Creswell et al. 2010; Hadwin et al. 2006).

A growing body of research suggests that children and their parents show similar levels of threat interpretation (Bögels et al. 2003; Creswell and O'Connor 2006; Creswell et al. 2005, 2011), although there is some inconsistency, with other studies failing to find an association (Creswell and O'Connor 2006; Gifford et al. 2008). In accordance with the intergenerational transmission hypothesis, it has been proposed that the transfer of verbal information is one pathway by which interpretation bias may be transmitted from parents to children (Field and Lester 2010a; Hadwin et al. 2006; Muris and Field 2010). Early research has found that parental verbal information affects children's interpretation bias and/or anxiety-related responses (Chorpita and Albano 1996; Dadds et al. 1996; Barrett et al. 1996). For instance, parents' anxious verbal information enhanced children's interpretation bias and avoidant responses following family discussions of ambiguous scenarios (Chorpita and Albano 1996), although other studies have failed to replicate this effect (Bögels et al. 2003; Cobham et al. 1999).

Furthermore, the nature of verbal information communicated by parents seems to be affected by parental anxiety. Field et al. (2008) found that when parents were presented with an equal amount of positive, negative, and neutral information about novel animals, their trait anxiety was associated with the level of negativity in the verbal information communicated to their children. Consistent with the above, Muris et al. (2010) found that when mothers received ambiguous information about unknown animals, their level of trait anxiety determined the transmission of fear beliefs to their children. Specifically, parents with higher anxiety communicated more threatening stories that in turn instilled greater fear beliefs in their children. Therefore, there is emerging evidence suggesting a potential pathway whereby parental anxiety affects the amount of threat they communicate to their children, which in turn affects their children's interpretation bias (Muris and Field 2010; Murray et al. 2009). It is possible that this transfer of verbal information may play a role in the intergenerational transmission of anxiety, or at least cognitive biases.

To our knowledge, all of the literature examining the intergenerational transmission of interpretation bias has focused on middle to late childhood, with early childhood

not considered. As parents have most influence over their children's lives in early childhood (Fox et al. 2005) and this is a period when children are learning rapidly, it seems possible that children may be particularly affected by information given to them by their parents at this age. Thus, extending intergenerational transmission of bias research to younger children may be important for understanding the early development of biases.

As the methods used with older children and adults are not developmentally appropriate for young children, there is a dearth of research examining maladaptive anxiety-related cognitions in young children more broadly. Recent research has begun exploring this crucial gap in the field by piloting a story-stem methodology to assess preschool children's interpretation of ambiguous stories (Dodd et al. 2012). In this study, 131 children aged between 3 years 2 months and 4 years 5 months completed the story-stem paradigm by finishing three ambiguous story-stems that were presented to them, with the use of dolls and props. The results showed that clinically anxious young children were more likely to give threat-related endings to the stories than non-anxious young children. However, the cross-sectional relationship between interpretation bias and child anxiety symptoms, as reported by parents, was not significant. Longitudinal follow-up provided some suggestion that interpretation bias, as assessed using the story-stem paradigm, may predict anxiety symptoms over time, with a significant association found with anxiety symptoms at 12-month follow-up but not at 2 or 5 year follow-up. As Dodd et al.'s (2012) research relied on just three story-stems, the authors acknowledged the need to extend the number of ambiguous stories to increase the sensitivity of the task to detect potential individual differences in young children's interpretation bias.

The present research had four principal aims: (1) to examine the association between anxiety and interpretation bias in young children using an extended version of the story-stem paradigm used by Dodd et al. (2012); (2) to investigate whether parents and their preschool-aged children share similar levels of threat interpretation; (3) to examine whether parental trait anxiety affects parent's tendency to end written stories for their children in a threatening way; and (4) to assess whether young children's interpretation bias is associated with parents' written story endings. The hypotheses evaluated were: (H1) young children's interpretation bias will be significantly related to their anxiety symptoms, (H2) parents and their children's interpretation bias will be significantly correlated; (H3) parents with higher levels of trait anxiety will end more of their written stories in a threatening way; and (H4) young children's interpretation bias will be significantly correlated with the number of parent written stories that end with threat.

Method

Participants

Participants were a community sample of 50 children (26 boys) aged 2 years 7 months to 5 years 8 months (mean age = 4 years, $SD = 6$ months) and their parents (mean age = 35 years, $SD = 5$ months) (45 mothers and 5 fathers). Participants volunteered to take part after hearing about the study via letters and advertising at local preschools and parent-toddler groups, the university's e-bulletin and via friends who had also taken part. A total of three hundred leaflets about the study were distributed at the preschools and parent-toddlers groups. Children with any identified developmental disorders were excluded from the study. In this sample, 94 % of children lived with both parents, most of whom identified as white British (90 %). The majority of parents were either working part-time (46 %) or at home by choice (38 %), while 10 % were working full-time. The majority of families (64 %) reported an above average net household income of £35,000 or above, while 18 % reported a net household income of £15,000 and under. The majority of parents had completed post-school qualifications (90 %).

Procedure

The School of Social Work and Psychology Research Ethics Committee at the University of East Anglia approved the methods of the study. The 1-hour experimental sessions were conducted either at participants' homes or the University, depending on the parent's preference. Parents provided written informed consent for themselves and their children, while the children provided verbal assent to the procedure of the study. During the session, the parents completed the questionnaires outlined above in a separate room while the children completed the story-stem paradigm, which was video-recorded. Families were thanked for their time and a small gift was given to the children.

Measures

Child Anxiety Symptoms

Parents completed the Revised Preschool Anxiety Scale (PAS-R; Edwards et al. 2010), which assesses anxiety symptoms in young children. The measure has good construct validity, and strong internal consistency, test-retest reliability and cross-informant reliability (Edwards et al. 2010). Internal consistency for the total score in this sample was Cronbach's $\alpha = .89$.

Parental Anxiety Symptoms

Parents completed the trait subscale (STAI-T) of the State-Trait Anxiety Inventory, Form Y-2 (STAI-T; Spielberger et al. 1983). The STAI-T is a 20-item self-report measure that assesses "relatively stable individual differences in anxiety proneness and refers to a general tendency to respond with anxiety to perceived threats in the environment" (Spielberger et al. 1983, p.3). The STAI-T has relatively high concurrent validity with other measures of anxiety, ranging from .73–.85, and strong internal consistency and good test-retest reliability (Spielberger et al. 1983). Internal consistency for this sample was Cronbach's $\alpha = .92$.

Child Interpretation Bias

A story-stem methodology was used to assess children's interpretation bias. This methodology has been used in previous research (Dodd et al. 2012) and has demonstrated reasonable success in assessing interpretation bias in young children aged between 3 years 2 months and 4 years 5 months. In the present research, eight ambiguous story stems (refer to Appendix 1) were presented to the children and they were asked to complete the story stems verbally, with the help of dolls and additional props. Children's responses were coded using the coding scheme described below. To ensure that the stories captured the range of anxiety typically experienced by young children, stories were selected and constructed based on themes of physical threat, social threat and separation anxiety. The story stems were designed to be ambiguous and to allow for interpretation as either threatening or non-threatening. From the total of eight stories (four physical, two social and two separation), two were adapted from Dodd et al.'s (2012) study, two were adapted from previous research examining interpretation bias in older children (Barrett et al. 1996), and four were created for the purposes of this research. To ensure the ambiguity of the story stems, six adult independent raters rated the stories using a 7-point Likert scale ranging from -3 (no threat) to $+3$ (threat), with a score of 0 indicating ambiguity in the story stems. The ratings reflected ambiguity for all the 8 story stems, with an overall mean of .08 ($SD = .65$).

Parent Written Stories (Verbal Information)

To examine the way parents communicated with their children about ambiguous situations, the 8 story stems described above were also included as a written story-stem measure, which asked parents to complete the stories according to how they would tell each one to their child. The

responses were coded by the researcher based on the coding scheme described below.

Parental Interpretation Bias

To measure parents' own interpretation bias, parents completed an interpretation bias measure consisting of 12 ambiguous scenarios (refer to Appendix 2); half the scenarios described social situations (e.g. "You're giving a speech. People in the audience start laughing, why?"), while the other half described non-social situations (e.g. "Your stomach starts to feel a bit funny on your way into work, why?"). Parents were instructed to imagine that they were experiencing each scenario and to write their interpretation of the scenarios on the questionnaire. Their responses were coded using the same coding scheme described below. The scenarios were adapted from Barrett et al. (1996) and Wisco and Nolen-Hoeksema (2010), and were developed in consultation with experts in the area. To ensure the scenarios were ambiguous, 13 independent adult raters rated the stories using a 7-point Likert scale ranging from -3 (no threat) to +3 (threat), with a score of 0 indicating ambiguity in the story stems. The ratings reflected ambiguity for all the 12 ambiguous scenarios, with an overall mean rating of -0.13 ($SD = 1.09$).

Data Analyses

For the three interpretation bias measures (child story-stems, parent interpretation bias measure, and parent written story-stem measure) participants' response to each story/scenario was coded individually for the presence of threat or danger (threat interpretation). A score of 1 was assigned when an interpretation was threatening and a score of 0 was assigned when no threat was present in the interpretation. Items were coded as 'missing' if the responses were ambiguous/unclear, irrelevant to the specific story-stem, or if there was non-response/non-compliance from the participants. To ensure that threat bias scores were comparable across participants, the mean number of interpretations coded that were threatening was calculated for each measure, as long as that participant had data available for at least 80 % of the scenarios on the relevant measure. Thus, data were not included in the analyses for any measures where participants had missing data on more than 20 % of the scenarios. More details on the coding and specific examples of responses coded as threat, non-threat and missing for each measure are provided in Appendix 3. The first author coded data from all three measures for the 50 parent-child pairs (400 stories for children's story-stems, 400 stories for the written story-stem measure, and 600 scenarios for the parent interpretation bias measure) but was blind to which measures came from the same

parent or parent-child pair. To check for reliability, a second coder also coded data from all the three measures for 25 % (13 parent-child pairs) of the randomly selected participant pairs (104 stories for children's story-stems, 104 stories for the written story-stem measure, and 156 scenarios for the parent interpretation bias measure).

Child Interpretation Bias

Out of a possible total of 400 stories, 115 (29 %) were coded as threat interpretation, 234 (58 %) were coded as non-threat, while 51 (12 %) were coded as missing data. Twelve children (24 %) had missing data on more than 20 % of stories, so no score was calculated for these participants. Missing data were due to child task refusal and ambiguity in responses from the children. Inter-rater reliability for children's total threat interpretations was $ICC(2,1) = .99$.

Parental Written Stories (Verbal Information)

Out of a total of 400 stories, 48 (12 %) were coded as threat interpretation, 348 (87 %) were coded as non-threat, while 5 (1 %) were coded as missing data. One parent (2 %) had missing data on more than 20 % of the stories, so no score was available for that participant. Missing data were due to non-response from parents. Inter-rater reliability for the written story-stem measure was $ICC(2,1) = .76$.

Parental Interpretation Bias

Out of a total of 600 stories, 136 (23 %) were coded as threat interpretation, 463 (77 %) were coded as non-threat, while 1 (.17 %) was coded as missing. Missing data were due to non-response from parents. There were no participants with missing data on more than 20 % of the scenarios. Inter-rater reliability for parental interpretation bias was $ICC(2,1) = .78$.

Results

All the variables described above were normally distributed, except for parents' written stories. There was a significant positive skew in the distribution of responses, all analyses involving this variable were therefore bootstrapped, and estimates using 1,000 bootstrapped samples are reported. Using a criterion-based z-score methodology, no outliers were identified.

The level of trait anxiety symptoms for both the parents and their children was explored. Independent samples *t* tests were conducted to examine differences between the

means and standard deviations from the normative data and that of the present sample. Parents' anxiety scores ($M = 37.78$, $SD = 9.08$, $N = 50$) were slightly higher than Spielberger et al.'s (1983) normative sample of working adults ($M = 34.79$, $SD = 9.22$, $N = 451$), $t(499) = 2.17$, $p = .02$, $d = .19$. In contrast, the children's anxiety scores in this sample ($M = 30.94$, $SD = 15.04$, $N = 50$) were significantly lower than Edwards et al.'s (2010) normative sample of young children ($M = 38.40$, $SD = 19.00$, $N = 764$), $t(812) = 2.72$, $p = .01$, $d = .19$.

There were no significant differences on age, gender or anxiety between children with complete total interpretation bias scores ($N = 38$) and those with incomplete data ($N = 12$), $t(46) = .73$, $p = .47$, $d = .10$; $\chi^2(1) = .25$, $p = .61$, $\phi = .02$; $t(48) = 1.70$, $p = .09$, $d = .49$. Note however, that the p value for anxiety approached significance suggesting that the participants with complete interpretation bias data may have been slightly more anxious than those with incomplete data. To ascertain whether the children with missing data may have differed on their interpretation bias, we compared children who had completed more than half of the story-stems but not enough for a reliable mean score to be computed (5 or 6 stories) ($N = 8$) with those for whom a mean score was available. No significant differences were found between interpretation bias scores, $t(8.25) = -1.01$, $p = .34$, $d = -.70$. We did not include participants who had only completed four or fewer story-stems in this analysis, as we did not feel we could make any valid inference about what their total score might have been.

Lastly, as two of the children in the present sample were younger than 3 years (2 years 7 months and 2 years 11 months), the analyses below were first conducted by including all the children in the sample and another by excluding those below 3 years. Findings from both sets of analyses were comparable so these children are included.

To investigate the hypotheses in the present study, Pearson's correlations were conducted first between young children's interpretation bias and their anxiety symptoms (H1), and second between parent and child interpretation bias (H2). No significant association was found between young children's interpretation bias and their anxiety symptoms, $r = -.03$, $p = .83$. There was a small negative relationship between parent and child interpretation bias, but this was not statistically significant, $r = -.25$, $p = .13$.

Bootstrapped Pearson's correlations were conducted between parental trait anxiety and parent written stories (H3), followed by parent written stories and children's interpretation bias (H4). No significant association was found between parental trait anxiety and parent written stories, $r = .13$, $p = .37$. There was a significant relation between parent written stories and children's interpretation bias, $r = .37$, $p = .02$. To explore this further, we

examined whether parent written stories might be associated with child anxiety levels but no significant association was found, $r = .15$, $p = .30$.

To examine whether the above findings were moderated by age and/or gender, exploratory analyses were conducted using multiple regression. For each hypothesis, a regression model was constructed that mirrored the relevant correlation above but also included age and gender as predictor variables. All two and three-way interactions were also included. Dependent variables were as follows: Child anxiety (for H1); child interpretation bias (for H2); parent written stories (for H3); children's interpretation bias (for H4). For H1, H2 and H3 the regression models were not significant, $p > .05$. For H4, the regression model including all predictors and interactions was significant, $F(7,27) = 3.85$, $MSE = .15$, $p = .01$, $R^2 = .50$. Examination of the coefficients indicated significant main effects of parent written stories, $b = 19.92$, $SE = 6.46$, child gender, $b = 1.65$, $SE = .72$, child age, $b = .07$, $SE = .02$, significant interactions between parent written stories and child age, $b = -.38$, $SE = .14$, parent written stories and child gender, $b = -9.35$, $SE = 4.04$, child age and child gender, $b = -.03$, $SE = .01$, and parent written stories, child age, and child gender, $b = .18$, $SE = .08$. To explore the three-way interaction, bootstrapped Pearson's correlations were conducted between parent written stories and child interpretation bias for the following 4 groups: 2–3 year old boys, 2–3 year old girls, 4–5 year old boys, and 4–5 year old girls. Large correlations were found for girls aged 2–3 years, $r = .93$, $p < .001$, and for boys aged 2–3 years, $r = .56$, $p = .19$, although the latter did not reach significance, the analysis is very underpowered. For both boys and girls aged 4–5 years, there was little evidence of an association between parent stories and child bias, $r = -.05$, $p = .88$, $r = .16$, $p = .69$, respectively. These associations can be seen in Fig. 1.

Discussion

There is some evidence that school-aged children exhibit similar levels of interpretation bias to their parents (e.g., Barrett et al. 1996; Creswell et al. 2011), and that this bias might be transferred from parents to their children via threatening verbal information (Field et al. 2008; Muris et al. 2010). The present study represents the first attempt to explore whether this intergenerational transfer of interpretation bias might also occur in preschool-aged children.

First, the present study attempted to replicate and extend Dodd et al.'s (2012) baseline findings in a typically developing population. Contrary to the first hypothesis, there was no significant relationship between young children's interpretation bias and their anxiety symptoms. Although

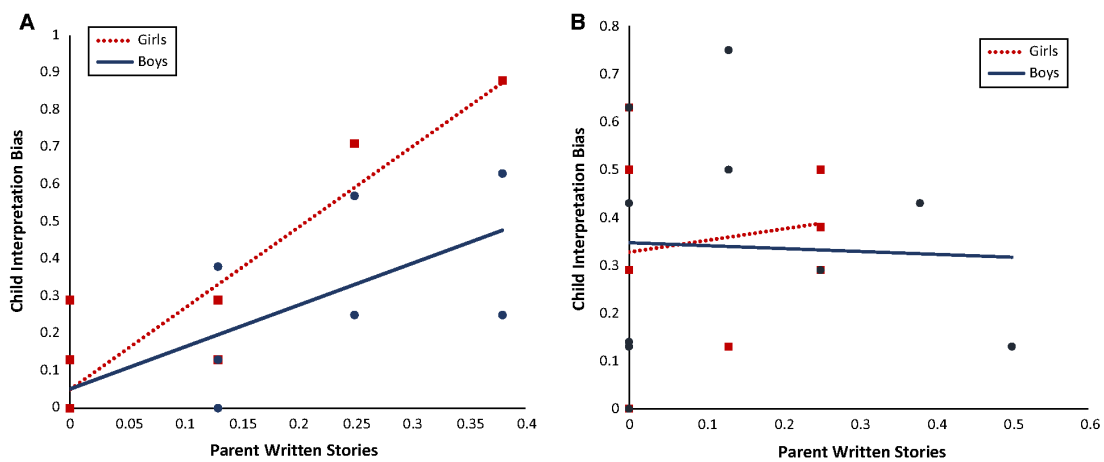


Fig. 1 The moderating effect of child age and gender on the association between parent written stories and child interpretation bias. **a** Children aged 2–3 years. **b** Children aged 4–5 years

Dodd and colleagues found a significant association between interpretation bias and clinical anxiety diagnoses, the correlation between child anxiety symptoms and interpretation bias was not significant and was comparable to that found here; $r = -.03$, $p = .83$, and $r = .13$, $p = .13$, respectively. It is plausible that this discrepancy in findings between clinical anxiety diagnoses and anxiety symptoms occurs because the link between interpretation bias and anxiety is a feature of clinical anxiety but does not vary with non-clinical individual differences in anxiety scores. As the present study adopted a community sample, the lack of variation in participants' anxiety scores may have limited the scope for detecting a significant effect. Nevertheless, given the comparable correlations with Dodd and colleagues, as mentioned above, this does not provide a complete explanation. One point that is an important consideration for the present research is that we don't yet know how stable any association between interpretation bias and anxiety is in young children or, indeed, how stable bias as assessed using the story-stem task is. Field and Lester (2010b) proposed that biases in information processing may not be present or fully developed in young children until certain cognitive, emotional and social skills necessary to sustain these biases have developed. In line with this, it is plausible that cognitive biases initially develop during the preschool years but that the association with anxiety isn't stable until later in childhood. For instance, during early childhood, children's capacity to anticipate negative outcomes (Muris et al. 2002) and to adequately recognize that a problem may have multiple possible outcomes in the context of ambiguity (Horobin and Acredolo 1989) develops significantly and these factors may affect

the emergence of an anxiety-linked interpretation bias. It is also plausible that the inconsistency with previous findings with older children could be due to the fact that anxiety symptoms here were reported by parents using a questionnaire measure; the most convincing associations between anxiety and bias in older children are found when children self-report their anxiety as compared to when parents report on their child's anxiety using a questionnaire measure (e.g. Creswell et al. 2011).

The second aim of the present research was to examine whether parents and their preschool-aged children share similar levels of threat interpretation. Contrary to the second hypothesis, young children's interpretation bias was not significantly correlated with their parent's interpretation bias. Although this is not in keeping with the inter-generational transmission hypothesis, it is consistent with some previous research that has also failed to find this association (Creswell and O'Connor 2006; Creswell et al. 2011; Gifford et al. 2008). The lack of association between parent and child interpretation bias could be influenced by the use of different points of view: parents' responses to the scenarios were based on themselves, while children completed the story-stems based on the dolls (i.e. Bob or Jane). Additionally, interpretation bias in parents and children were measured using different response methods. To ensure that the task was developmentally appropriate, children completed the story-stems verbally, while parents completed a pencil and paper measure. Moreover, in efforts to incorporate developmentally-relevant themes, children's story-stems were physical (50%), social (25%), and separation (25%) in nature, while parents' interpretation task mainly measured general (50%) and social (50%)

anxiety. To enable greater comparability across informants, future research could ask children to respond to the story-stems based on their own perspective, as well as develop parallel versions of the interpretation bias task for parents and their young children, at least in terms of content. Further research, ideally using longitudinal methods, could provide clearer insight into the association between parents' and their children's interpretation biases over time and might help to tease apart the potential effect of cognitive maturation on the development of maladaptive cognition in young children.

The third aim was to examine whether parent trait anxiety was associated with the number of written stories they ended in a threatening way when asked how they would tell their child the stories. Results were not consistent with the third hypothesis; there was no evidence for a significant relationship between parental trait anxiety and their written stories. It is possible that parents from a community sample may be more wary about communicating threat to their children, and may be deliberately selective about ending stories in a non-threatening manner, regardless of their trait anxiety. However, previous research involving community samples suggests that parents who were more anxious indeed told more threatening stories to their older children (Field et al. 2008; Muris et al. 2010). Future research could investigate whether this inhibitory effect may be particularly prominent in parents with young children, possibly due to greater perceived vulnerability of younger children.

As existing research on the effect of parental verbal information on children's interpretation bias predominantly focuses on children aged 7 years and older (Barrett et al. 1996; Chorpita and Albano 1996; Dadds et al. 1996; Muris et al. 2010), the final aim of the present study was to investigate whether young children's interpretation bias was linked to their parents' written stories. The results supported the hypothesis, indicating that children's interpretation bias was associated with the amount of threat in parents' written stories. Consistent with previous research, these findings support the idea that parental verbal information might affect preschool children's biases. Although there was no evidence for an association between parents' story-telling and children's anxiety symptoms, it is important to consider that Dodd et al. (2012) found that children's interpretation bias predicted child anxiety 12-months later. Thus, parent stories may affect children's interpretation of ambiguity, which may in turn affect their vulnerability for anxiety over time.

Exploratory analyses regarding the possible moderating effects of children's age and gender indicated that parents' written stories were associated with interpretation bias in younger children (2–3 years) but not older children (4–5 years), and that, in younger children, the association

was stronger for girls than for boys. There was a very strong significant correlation between parents' written stories and interpretation bias in girls aged 2–3 years, while the correlation for boys of a similar age was large, this did not reach statistical significance given the small sample. This may indicate that younger children are particularly receptive to parents' verbal information, with girls being more affected than boys. Alternatively, as most of the parent participants were mothers, the association may be stronger when the parent is the same sex as the child; there were not enough fathers in the present sample to explore this question specifically. It is important to note that these findings are very preliminary as this analysis was exploratory and the study was not powered to address these questions. However, they do indicate that there may be some important age and gender effects that could be further explored in future research.

As the present research is cross-sectional, we are unable to draw conclusions about direction of the effects. It remains possible that parents anticipate how their child would tell the story and complete the written story-stem measure with that in mind. To examine causal pathways convincingly, future research could explore the use of the story-stem paradigm as an experimental manipulation, focused on training parents to tell their young children stories in a particular way. If children's interpretation bias decreases after parents tell them non-threatening stories, this would provide convincing evidence that parent verbal information can affect children's bias. Ultimately, this could be useful as a preventative intervention, nicely extending recent research (Lau et al. 2013), which demonstrated potential clinical implications for the use of positive parental verbal information in reducing children's (aged 7–11 years) threat interpretation and social anxiety symptoms through story telling.

The main strength of the present study was the focus on preschool-aged children in exploring the intergenerational transmission of interpretation bias, as previous research has almost exclusively focused on older children. The preschool years may be crucial for exploring the developmental origins of interpretation bias. The present study is the first to extend the story-stem paradigm beyond the three ambiguous stories piloted by Dodd et al. (2012) and to trial the paradigm in an unselected sample.

The research has some limitations, and the results should be interpreted with these in mind. As is the case with other similar research, fathers were underrepresented in this sample. The parent measures (parent interpretation bias and written stories) were predominantly completed by mothers (90 %) even though it is likely that both parents play a role in influencing their child's cognitive biases, necessitating greater inclusion of fathers in future research. Furthermore, it is likely that a number of factors affect

children's interpretation bias and the association between parent cognitions and children's bias, including ethnicity, socio-economic status, as well as shared negative experience. The present research was not designed to address these questions and a much larger sample would be required. Nevertheless, this remains an area of interest for future research.

Furthermore, the present study adopted a written story-stem measure instead of requiring parents to tell the stories directly to their children. This variable was measured using a paper and pencil format to maximise the reliability of coding, minimize the child's participation time, and avoid issues relating to the bi-directionality of effects between parents and their children whilst the parents told the stories. It is worth noting that we initially piloted a task where parents told their children the stories directly, after the children had completed their own story-stems. We found that the children could not attend to the task for long enough for us to complete both in a single session so we adapted the procedure to written stories. The drawback of this method is that it is possible the way parents say they would tell their children the stories might not be representative of how they would actually tell the stories. It is also possible that the written stories may tap into other closely related domains of parental cognitions, such as parents' extension of their interpretation bias to situations involving their children (e.g. Lester et al. 2012, 2009) and/or parents' expectation of their children's responses to the ambiguous situations (e.g. Creswell et al. 2011), which have been found to be associated with parents' anxiety and children's interpretation bias and/or anxiety symptoms, respectively. Future studies could clarify some of these possibilities by including a condition requiring parents to tell the stories to a young child who they are not acquainted with, as well as asking children to complete the story-stems based on themselves.

Finally, caution should be maintained when interpreting the results due to the following issues. The relatively small sample size may have undermined the chance of detecting possible effects due to a lack of statistical power in the present study. A sample of 50 participants provides 98 % power to detect a large effect size, but results suggest that the size of the relationships of interest is modest at best. For the present research, the rate of missing data for young children's interpretation bias was 24 %, reducing the total sample size to 38 children with usable data for this variable. This was comparable to Dodd et al.'s (2012) research that had a 30 % missing data rate for the same variable and future research of a similar nature will need to account for the rate of missing data when estimating the appropriate sample size. In addition, the sample may not be entirely representative as the analyses showed moderate effect

sizes for group differences in anxiety symptoms and interpretation bias between children with complete total interpretation bias scores and those with missing data, suggesting that children included in the analyses may be more anxious, but have lower threat interpretations, compared to children with missing data. This could be due to greater compliance during the story-stem paradigm by children who were more anxious.

The findings of the present research indicate that how parents report they will tell stories to their children is associated with their threat cognitions that have been linked with children's risk for anxiety over time (Dodd et al. 2012). These findings provide some initial suggestion that early interventions might be able to use parental verbal information as a means of changing maladaptive cognitions in at-risk or anxious young children. Accordingly, future efforts could pilot the use of the story-stem task within an experimental paradigm to evaluate whether positive parental verbal information could be transferred via storytelling and doll-play to young children.

Acknowledgments Thanks to the parents and children who volunteered, and to the relevant gatekeepers at preschools and parent-toddler groups that supported this research and allowed access to the participants. Thanks also to Benjamin Marshall for his assistance in reliability coding.

Appendix 1: Children's Interpretation Bias Measure (Ambiguous Story-Stems)

1. This is the park. Here is the family walking in the park. Look, there is this high high rock. Jane wants to climb the rock.
2. Look. These children are playing a fun game. Jane wants to join in. She is getting close. It looks like the children are laughing.
3. This is the park. Jane is playing alone. A group of kids walk towards Jane.
4. Jane and mum are standing by the pavement. They want to cross a busy street to go to the park. There are many cars passing by.
5. Susan is having a fun party at her house. Jane wants to go to the party. Mum is busy so she drops Jane at the party. Mum is about to drive away.
6. Mum and Dad are going out for the night. Susan, the babysitter will stay home with Jane. Mum and Dad are about to leave the house.
7. Mum and Jane are swimming in the pool. They are holding hands. Jane lets go of mum's hands.
8. Jane is at the park. Suddenly, a dog runs towards her.

Appendix 2: Parent Interpretation Bias Measure (Ambiguous Scenarios)

1. It's your second week on the job. Your boss stops by your desk in the early afternoon and asks you to come to his office later that day. Why does your boss want to see you?
2. Your child's teacher calls during the day when your child is at school. Why are they calling?
3. You're lying in bed at night when you hear a noise, what might it be?
4. You're on a plane and the pilot tells the passengers to return to their seats and fasten their seatbelts, why?
5. Your stomach starts to feel a bit funny on your way into work, why?
6. You reach into your bag to get your mobile phone out and you can't find it, why?
7. A friend calls and leaves you a voicemail saying, "Give me a call. I need to speak to you. It's important." What does he/she want to talk to you about?
8. You are having a party for your birthday and half an hour after it started, there's still only a few people there, why?
9. You walk into a party and people turn to look at you, why?
10. You see two of your closest friends at the shopping centre together. They didn't tell you they were going. Why?
11. You're walking down the street, and you see one of your friends coming the other way with a group of people. You wave, but your friend doesn't respond. Why?
12. You're giving a speech. People in the audience start laughing. Why?

Appendix 3: Coding Scheme Examples

1. Threat

Responses with mild or strong presence of danger

Child examples: Falls down from rock, gets hit by car, dog bites child

Parent examples: Child is ill/hurt at school, audience laughing because he/she said something wrong

2. Non-Threat

Responses without the presence of danger

Child examples: Jumps down from rock, crosses to the other side of the road, strokes and rides on dog

Parent examples: Child forgot lunch box at school, audience laughing because he/she told a joke

3. Missing

Responses that are unclear, irrelevant or non-compliance/non-response to task or don't know

Child examples: Child blasts off in a space ship from rock, child doesn't know what happens in the situation

Parent examples: Friend called because she is pregnant, Don't know why the boss wants to see him/her

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Appendix 2

Children's Interpretation Bias Measure (Ambiguous Story-Stems)

1. This is the park. Here is the family walking in the park. Look, there is this high high rock. Jane wants to climb the rock.
2. Look. These children are playing a fun game. Jane wants to join in. She is getting close. It looks like the children are laughing.
3. This is the park. Jane is playing alone. A group of kids walk towards Jane.
4. Jane and mum are standing by the pavement. They want to cross a busy street to go to the park. There are many cars passing by.
5. Susan is having a fun party at her house. Jane wants to go to the party. Mum is busy so she drops Jane at the party. Mum is about to drive away.
6. Mum and Dad are going out for the night. Susan, the babysitter will stay home with Jane. Mum and Dad are about to leave the house.
7. Mum and Jane are swimming in the pool. They are holding hands. Jane lets go of mum's hands.
8. Jane is at the park. Suddenly, a dog runs towards her.

Appendix 3**Parent Interpretation Bias Measure (Ambiguous Scenarios)**

1. It's your second week on the job. Your boss stops by your desk in the early afternoon and asks you to come to his office later that day. Why does your boss want to see you?
2. Your child's teacher calls during the day when your child is at school. Why are they calling?
3. You're lying in bed at night when you hear a noise, what might it be?
4. You're on a plane and the pilot tells the passengers to return to their seats and fasten their seatbelts, why?
5. Your stomach starts to feel a bit funny on your way into work, why?
6. You reach into your bag to get your mobile phone out and you can't find it, why?
7. A friend calls and leaves you a voicemail saying, "Give me a call. I need to speak to you. It's important." What does he/she want to talk to you about?
8. You are having a party for your birthday and half an hour after it started, there's still only a few people there, why?
9. You walk into a party and people turn to look at you, why?
10. You see two of your closest friends at the shopping centre together. They didn't tell you they were going. Why?
11. You're walking down the street, and you see one of your friends coming the other way with a group of people. You wave, but your friend doesn't respond. Why?
12. You're giving a speech. People in the audience start laughing. Why?

Appendix 4

Coding Scheme Examples for Children's Interpretation Bias Measure and Parent

Written Stories

1. Threat

Responses with mild or strong presence of danger

Child examples: Falls down from rock, gets hit by car, dog bites child

Parent examples: Child is ill/hurt at school, audience laughing because he/she said something wrong

2. Non-Threat

Responses without the presence of danger

Child examples: Jumps down from rock, crosses to the other side of the road, strokes and rides on dog

Parent examples: Child forgot lunch box at school, audience laughing because he/she told a joke

3. Missing

Responses that are unclear, irrelevant or non-compliance/non-response to task or don't know

Child examples: Child blasts off in a space ship from rock, child doesn't know what happens in the situation

Parent examples: Friend called because she is pregnant, Don't know why the boss wants to see him/her

Appendix 5**Fear Beliefs Questionnaire (FBQ)**

(Field, Argyris & Knowles, 2001)

1 2 3 4 5
No, not at all No, not really Yes, maybe Yes, probably Yes, definitely

1. If you had a Cuscus/Quokka as pet, would you be afraid when you had to clean its cage?
2. Would you find it scary to feed a Cuscus/Quokka?
3. Would you find it scary to touch a Cuscus/Quokka?
4. Would you quickly run away if you saw a Cuscus/Quokka?
5. Do you think that a Cuscus/Quokka will bite you?
6. Would you feel scared if you encounter a Cuscus/Quokka?
7. Do you think that the Cuscus/Quokka will hurt you?
8. Would you go quickly inside if you would see a Cuscus/Quokka near your house?
9. Do you believe that the Cuscus/Quokka can make you ill?
10. Would you be nervous if you had to enter a room with a Cuscus/Quokka?

Appendix 6

Ambiguous and Threatening Information

(Muris, Rassin, et al., 2009)

Ambiguous Information:

The Cuscus/Quoll has white teeth.

The Cuscus/ Quoll eats all sorts of things.

The Cuscus/ Quoll can jump.

The Cuscus/ Quoll has a unique smell.

The Cuscus/ Quoll is noticeable.

The Cuscus/ Quoll lives like some other animals.

The Cuscus/ Quoll makes noises.

The Cuscus/ Quoll likes to drink all sorts of things.

The Cuscus/ Quoll has claws and scratches trees.

You never know what the Cuscus/ Quoll will do.

Threatening Information:

The Cuscus/Quoll has long sharp teeth.

The Cuscus/Quoll eats scary insects.

The Cuscus/Quoll can jump up at your throat.

The Cuscus/Quoll stinks.

The Cuscus/Quoll is dangerous.

The Cuscus/Quoll kills other animals.

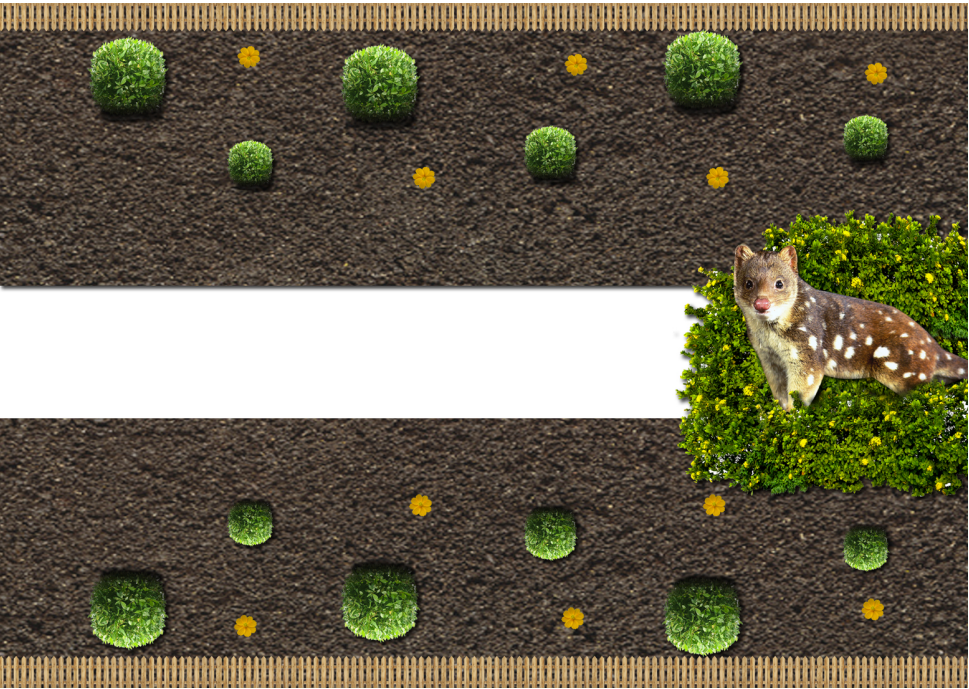
The Cuscus/Quoll makes frightening noises.

The Cuscus/Quoll likes to drink blood.

The Cuscus/Quoll has sharp claws and scratches your skin.

The Cuscus/Quoll will attack you.

Appendix 7
Nature Reserve Map (NRM)



Appendix 8

Interpretation Generation Questionnaire (IGQ)

(Dodd, Stuijzand, Morris, & Hudson, 2015)

1. It's your second week on the job. Your boss stops by your desk in the early afternoon and asks you to come to his office later that day. Why does your boss want to see you?
2. You're lying in bed at night when you hear a noise, what might it be?
3. You're on a plane and the pilot tells the passengers to return to their seats and fasten their seatbelts, why?
4. Your stomach starts to feel a bit funny on your way into work, why?
5. A friend calls and leaves you a voicemail saying, "Give me a call, I need to speak to you. It's important." What does he/she want to talk to you about?
6. You are having your birthday party and half an hour after it started, there's still only a few people there, why?
7. You walk into a party and people turn to look at you, why?
8. You see two of your closest friends at the shopping centre together. They didn't tell you they were going. Why?

Appendix 9

Coding Scheme for the Interpretation Generation Questionnaire

1. Every interpretation should be coded as negative (1) or not negative (0) or ambiguous (77) or uncodeable (999). A negative code should be given for any interpretation that suggests a negative outcome for the participant or reflects negative attributions about the self. Bear in mind that this is absolute, not relative to the worst-case scenario, so you should code negative even when this may not be the most negative interpretation possible.
2. Focus on the interpretation itself, rather than over-thinking all of the possible knock-on implications and long-term consequences of the interpretation.
3. Be careful that your own interpretation bias doesn't affect your coding. Imagine for example the scenario where your boss asks to speak to you. If a participant gives the interpretation "because they want to introduce me to someone" this could be a positive or a negative event depending on how you feel about meeting new people and should therefore be coded as neutral. You shouldn't code it as a negative event just because you as a coder feel that it is a negative event, you need to take a step back from your own interpretation and think about how other people might feel in order to code it accurately.
4. Consider the context of the scenario when assessing the interpretation. For example, imagine a scenario where you hear a noise during the night. If the participant says it is their child/partner etc. then this would be a non-threat interpretation. However, in this context if they say it is 'someone' in the house, they are more likely to mean someone they don't know, which should be coded as negative. There will be ones that are tricky but sometimes considering the context of the scenario will help.

Difficult coding:

There are several things participants say that are difficult to code (missing 999):

- Use of 'something' e.g. something happened, to talk about something. This isn't clear whether something is good or bad. In this situation, consider the context of the scenario and whether it is equally likely that something refers to something positive/negative and if it is equally likely, code as ambiguous (77). Keep in mind your own biases here and try to be objective about the likelihood that something is negative (see also above example of 'someone' in the house).
- Use of 'funny' – it is often unclear whether the participant means that they had intended to be funny so, if it is unclear you will need to code it as non-threat. For example, 'people are laughing at me because I did something funny' could be positive if they are trying to be funny but people could be laughing at them for something they don't find funny (so in a cruel way). Only code as threat if it's clearly negative.
- Use of 'surprised'. Again, look at the context and see whether it's equally likely to be positive or negative. Code as ambiguous unless it is clearly most likely to be a negative/threatening surprised. E.g. 'they are surprised at my results' could be positive or negative so should be coded as ambiguous.
- If the interpretation is ambiguous, code as (77) but if the interpretation doesn't make any sense or it's clear the participant is not taking the task seriously – code as missing (999).